American Machinist

Established 1877 McGraw-Hill Publishing Company, Inc.

New York, August 7, 1930

# NEW EQUIPMENT at the rate of Ten Per Cent Per Year

K. H. Condit
*Editor*

**From an interview with Henry K. Spencer, General Manager, The Blanchard Machine Company**

As J. R. WEAVER, of Westinghouse Electric, pointed out in his article on page 1013, Vol. 72, it is necessary to present the equipment replacement problem to the management so that the advantages of replacing obsolete tools are evident. But there is another bit of psychology that is also important. If you can get a board of directors in the habit of spending for replacements a reasonable amount each year, say ten per cent of the total equipment inventory, you soon get to the point where obsolete equipment is no longer a problem.

In the first place, the average age of your equipment settles down at about five years, and in the second place, the directors take it as a matter of course that they should spend something each year on machine equipment.

Some people have the impression that a policy of this sort is applicable only in a company of some size. Nothing could be farther from the truth. It works just as well in the organization of moderate size.

In The Blanchard Machine Company's plant, for example, there are approximately 70 machine tools. Seven years ago the policy of replacing ten per cent of these tools each year was adopted. Four years later, in 1927, the average age of the equipment in service was something over ten years. Today it has dropped to almost exactly six years.

It should be said that it was found inadvisable to adhere strictly to the ten per cent limit every year. In

one or two years the replacements fell below that figure, partly because the new models of the tools that should have been replaced that year were not sufficiently ahead of the old ones to insure adequate savings. But in other years, 1929 for instance, the ten per cent limit was exceeded because the shop was extremely busy, and it was therefore profitable to get as many new machines into action as possible. Over the whole period the average has been about ten per cent.

So carefully has the replacement policy been carried out that only one of the tools purchased has failed to justify the investment. And in this case the tool, which was bought for $2,100, was sold two years later for $1,500.

ASIDE from tangible cost reductions there have been other advantages from the policy in question.

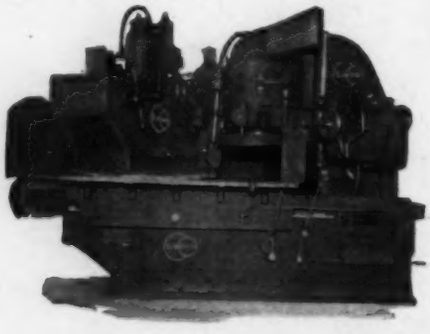
The greater productivity of the new machines has reduced congestion in the shop and made it easier to handle materials and parts to and from the machines because the former crowding of equipment was relieved. Generally speaking, and for the same productive capacity, two new machines have replaced three old ones. This improvement is expressed as it is because the sales of the company have grown from year to year, and production has naturally followed suit.

The company secured, in 1929, over one-third more production on four models of its product than it secured in 1918 when the whole effort was concentrated on one model. Had new equipment not been installed it would have been necessary to increase the building area considerably. The only increase in machine shop space is a small part of one floor which was released when a new erecting shop was built.

Maintenance charges have been considerably reduced. The plant, being relatively small, never supported more than one maintenance man, but today he spends a large part of his time on other work. The reasons for this change are several. Parts replacements now come through from the builders as standard parts, machined to size, and seldom require any fitting. The few belt-driven machines that are purchased are arranged for motor drive. The change-over is quick and easy when motorization becomes desirable.

In addition to these advantages, there is the reduction in down time of machines and the improvement in morale. The men like to operate the new machines, take pride in them, and pay more attention to keeping them in good shape.

The final proof of any such replacement policy lies in the dollar savings. Here are some of the actual savings, expressed in time instead of in dollars, but just as real, nevertheless, because time in a machine shop is easily translated into dollars.



Two modern turret lathes are now handling four jobs formerly done on engine lathes or older turret lathes. A mitre gear which was formerly cut from a bar, hole chucked and finished on one side, then finish-turned on an engine lathe at a rate of 100 pieces in 98 hours, now comes from the modern turret lathe at a rate of 98 pieces in 38½ hours, or a saving in time of 60 per cent.

A feed shaft formerly cut off, centered, and finished on a lathe at a rate of 60 pieces in 100 hours, now comes from the modern turret lathe at a rate of 50 pieces in 20½ hours; or a saving in time of 70 per cent.

A handwheel pinion shaft, formerly roughed out on an old style turret lathe and finished on an engine lathe at 90 pieces in 107 hours, now comes from the modern machine at a rate of 50 pieces in 19½ hours; or a saving of over 67 per cent.

A spindle formerly finished complete on a lathe at a rate of 30 pieces in 262 hours, comes from the turret lathe at a rate of 60 pieces in 112 hours, or a saving of 78.6 per cent.

A modern 5-ft. radial drill replaced an older model, 4-ft. radial of the same make. The new radial drilled 30 bases in 89 hours, as against 129¼ hours for the older one; and 50 gearboxes in 90½ hours, as against 30 in 90½ hours. Savings — 31 per cent and 41.5 per cent, respectively.

A modern horizontal boring machine cut the time on heads from 357 hours for 30 pieces to 222¾ hours, a saving of 37.5 per cent in time per piece.

If anyone is interested in working out the dollar savings on these jobs, I suggest that he apply the Warner & Swasey or SKF replacement formulas explained in articles appearing in Vol. 71, Nos. 1 and 19, and Vol. 72, No. 18.

So far as The Blanchard Machine Company is concerned, its executives are entirely satisfied with the soundness of their replacement policy and pleased with its results.

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## Where do you stand?

**Not many companies can point to an average equipment age as low as the one mentioned in the foregoing article. Even so, many of them might be moved to remedial action if they should compare their own status with that of the whole group of companies in their respective fields. To secure such average figures was the purpose of the second *American Machinist* equipment inventory just completed. Publication of the results, by industries, will begin shortly. Study them and see where you stand.**

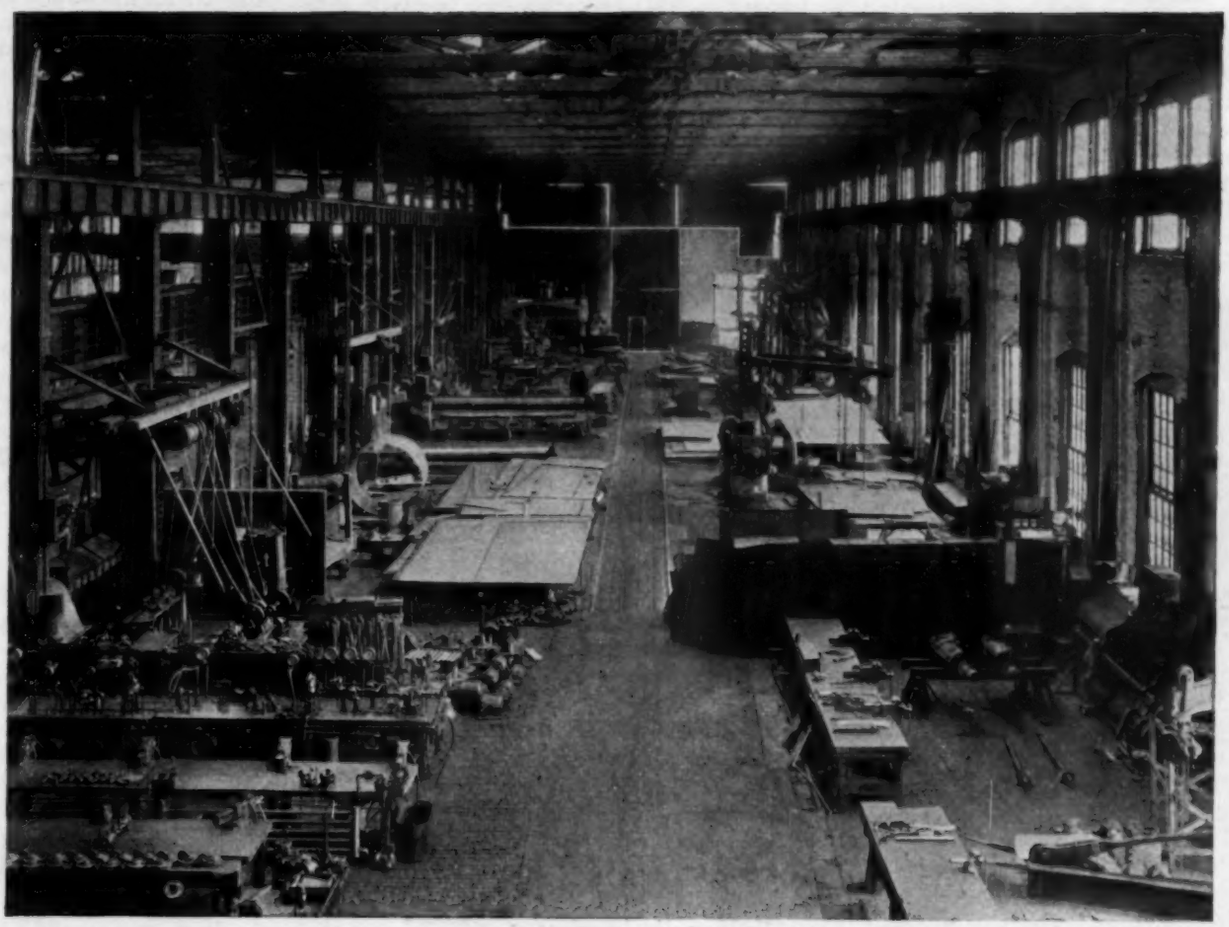

Fig. 14—Boiler shop, and air brake and stoker repair departments are in the same building

# THREE A DAY

CHESTER B. LORD
*Associate Editor*

**This is the final article of three telling how the Mt. Clare shops of the B & O complete repairs on three locomotives every working day by the spot system**

IT IS self-evident that the spectacular part of the spot system at the Mt. Clare shops of the Baltimore & Ohio Railroad, at Baltimore, Md., cannot function with the celerity and lack of lost motion I have given it credit for unless it has efficient backing. Napoleon remarked that victory always lies with the one who can move the most troops to a given spot in the shortest time. Most military maxims are applicable to industry, and the one referred to has been applied effectively. In this instance it means moving the most material in the shortest time.

There are several machine shops at Mt. Clare, and as might be expected, each does the work it is best adapted for—straight manufacturing, or repair work. The various shops that serve the spot system are in a building adjacent to and parallel with the one in which the locomotives are spotted. The heavy work is done on the ground floor and the lighter work on the second floor. There are entrances on three sides of this building for incoming material, and the fourth, or north side is separated from the assembly shop by only a brick curtain. On the lower floor there are numerous arches which afford an ideal means of furnishing material to

the different "spots" with a minimum of transportation.

In the general layout occur the legends, "Spring rigging entrance," "Cylinder entrance," "Wheels in," "Wheels out," and similar instructions. Each part is received from the stripping track at the door nearest the place it is to be machined or conditioned, and in turn it is machined or conditioned as near the spot where it is to be used as the physical features of the buildings will permit.

Material traffic is always in one direction. Generally speaking, it comes in on three sides and goes out on the fourth. There are exceptions to this as in the case of driving wheels, but even here, the traffic is unidirectional because an entrance different from the exit is provided. Inasmuch as the wheeling, unwheeling, and transportation of heavy material are done at night there is no disturbance caused by this exception to the general rule.

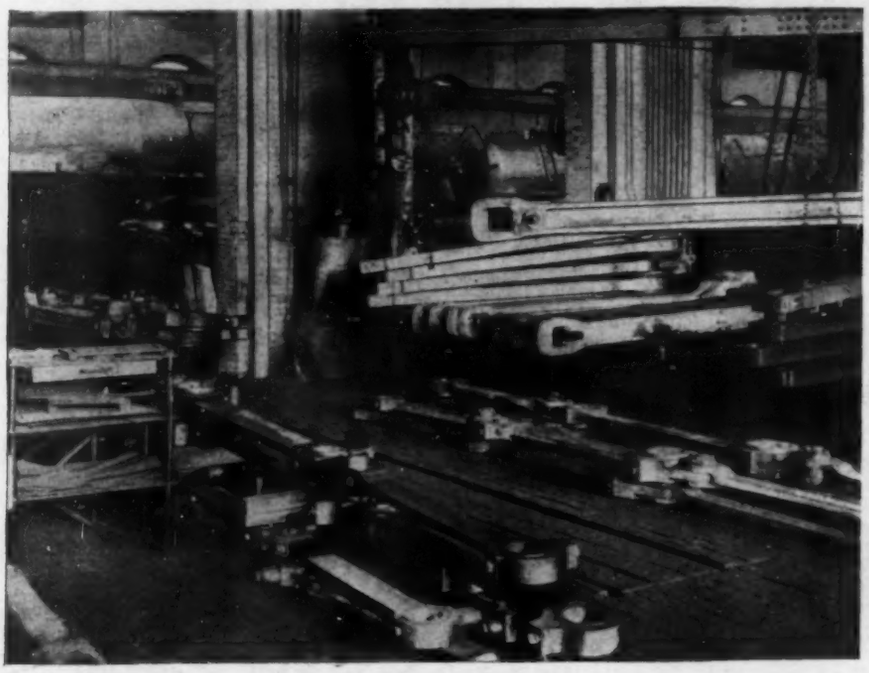

Fig. 15—Finished rods are handled only once. They are assembled when lifted from the transfer car

The task of arranging the machines and equipment so that the work on the different parts can be done opposite or near the "spot" on which the work is to be used, was no small part of the work necessary to the successful operation of the system as a whole. As the superintendent expressed it: "We had the whole shop on wheels for two years." Whether this is literally true or not, it is indicative of the study given this particular subject and of the attention to detail that characterizes the whole system.

When one stops to think of it, no one should be able to appreciate the value of direct non-interfering paths for transporting material as much as railroad men whose whole business it is to transport material quickly and safely by the shortest route.

It is a well-known fact that the shortest distance between two points is a railroad—on its own map, and the transportation of material in these shops is as unidirectional and non-interfering as it is mapped out on the main line.

An arrangement of machines and transportation facilities that will allow of such conditions is not brought about by segregating the different departments in separate buildings or enclosures, and we have the apparent incongruity of a boiler shop, an air brake, and a stoker repair department adjacent to one another in the same open space. A study of Fig. 14 will show that the separation of the three departments is just as complete as though walls divided them.

The material for the boiler shop comes in at the east end and goes out through the north side at the point at which it is to be used. The stokers are stripped on Spot No. 1 and come in from the south. The air-brake material goes through the washing vats and comes in from the west. Each type of work goes out the north side at or near the point where it is to be used. This arrangement of departments is necessary to secure the maximum of service with the minimum of material movement, and in turn the uniflow method prevents interference and confusion. "All things work together for the benefit of those who know how to make them."

On the other hand, this practice is not carried to extremes. The jacket work, for instance, is done in a separate building. It is stripped outside, loaded directly on a ball-bearing, rubber-tired trailer ar-

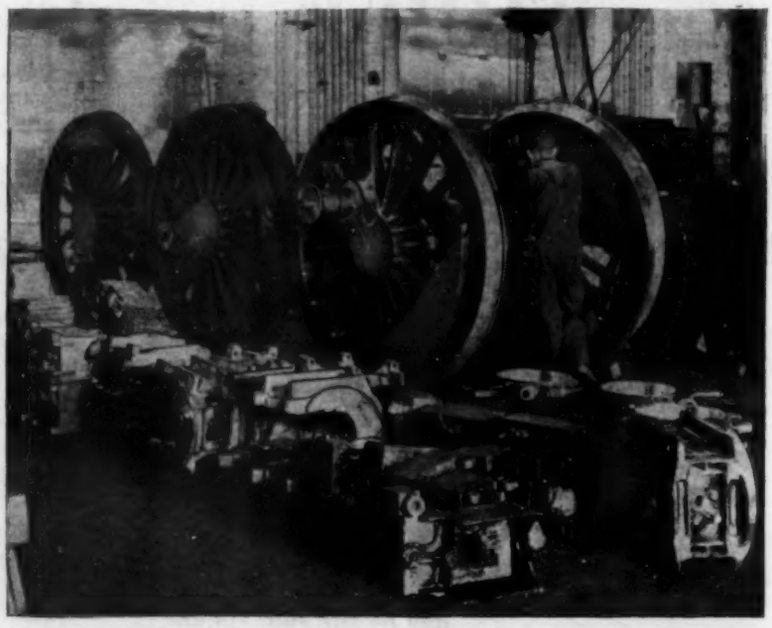

Fig. 16—Three sets of wheels are fitted each day and moved each night

ranged for the purpose, and transported to the jacket shop. When wanted it is again loaded on the car and transported along the unused track in the assembly shop to the place where it is to be used.

One of the dangers of laying out a comprehensive system is the temptation to become enthusiastic and lose sight of the fact that it is low cost we are after and not a system. Where handling material at night is economical from any point of view, it is handled that way; if it is not, it is handled otherwise. Side and main rods are an example of this. Articulated rods, or any rods in fact, are inconvenient to handle; there would be no advantage in transporting them from the machine shop, unloading them in the assembly shop and then picking them up again for assembling.

Instead of doing that, one set is loaded on a transfer car as shown in Fig. 15, and when wanted, it is shoved out into the main shop. The crane takes them from the car as the rod men assemble them and the car is pushed back for another set, which is ready on the floor alongside. The time for assembling each set is practically a constant, and the crane is scheduled for a definite length of time to do this work.

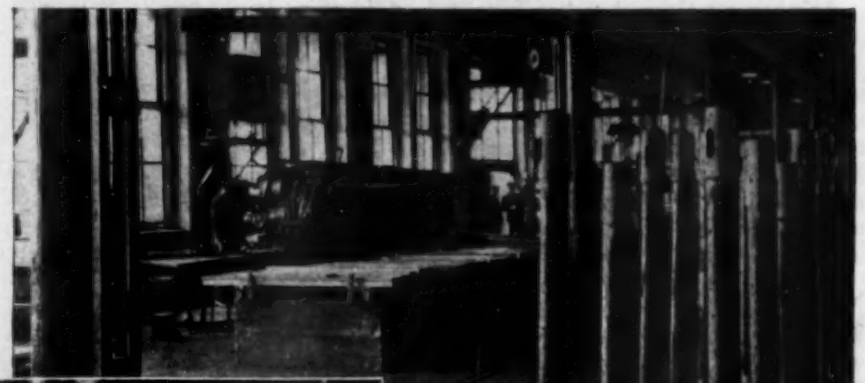

**Fig. 17—Pistons are fitted and guides ground opposite the place they are to be used**

**Fig. 18—Tool replacement. The operator turns the switch on the post and lights the lamp when he uses his spare tool. The tool replacement man replaces the dull one. Switches and lamp are circled**

Most shop executives agree that sufficient room and lack of interference increases output substantially. Others claim that a crowded condition compels more efficient methods. In this instance we have both. To double the output and have more clear space than formerly is certainly as good a test of management as one could wish.

Driving boxes, and eccentrics where Stevenson valve gear is used, are assembled to the wheels in the machine shop at or near the "Wheels out" arch. It will be noted that the boxes, cellars, and other parts for the remaining sets, are ready and on the floor alongside. Three sets of wheels will be out in the shop ready for the rod gang, at 7 o'clock in the morning.

Another feature of the Mt. Clare shop is the absence of unnecessary helpers. The further south we go, the more a colored helper seems necessary to the happiness and well-being of a machinist, but here, we do not find helpers doing the work while the machinists boss.

Each man goes about his work, handles his own material, and feels responsible for his own output.

In the majority of back shops the most fussy and time killing job is fitting frame bolts. These bolts are of numerous sizes and lengths. On the built-up type of engine frame, they serve to hold the different members together, as well as holding the auxiliary fittings to the frame. These bolts taper $\frac{1}{16}$ in. to the foot, and good practice demands that they be fitted to leave a definite length for driving, after the bolt is firmly seated.

In many shops each bolt is fitted individually. In other shops they are made to a number of standard sizes, and it is considered efficient practice to fit up a portable lathe that can be moved near to the frame to be fitted, and finish the bolts to size. A good bolt man is considered a valuable employee, but the chief recommendation for the use of either of the practices described above is that it is the least bothersome to management.

In the Mt. Clare shops, frame bolt reamers are graduated every six inches, and every hole that requires reaming is reamed to one of these numbered graduations. The man who does the reaming marks the graduation number near the hole, whether he reams it or finds it does not need it. The bolt man afterward measures the length, gets the bolts from stores and drives them. No special bolts are made.

Fig. 19—Five men are kept busy grinding tools. How many machine operators do they take the place of?

Another problem that has been solved in this shop is tool grinding. Ask the superintendent of almost any shop if he grinds all his tools in the tool crib and he will unhesitatingly say, "yes." Ask him about special tools, and he will hedge by saying that, in such a case, it costs too much to set up a tool grinder for a single tool, and in that he is correct. Not to grind all tools in the crib is not a sign of bad management, but to do so, consistently and 100 per cent, is distinctly the mark of good management.

NEAR each post in the machine shop is a switch which lights one of two lamps, indicating whether the operator wants the foreman, or a new tool to replace the spare one he has just placed in use. The tool replacement man has a 3-wheeled barrow and carries tools and drills for every machine in the territory he covers. This is one of the few shops, aside from strictly repetitive ones, where all tools, without exception, are ground in the tool room.

It requires the entire time of five men in the grinding room and of two tools collectors. It will be conceded that the grinder can easily sharpen two tools while a machine hand is grinding one. Whether we count the tool collectors as a saving, and whether we include the grinding of new tools, it would mean from 8 to 10 men absent from their machines all the time. This does not seem possible when one attempts to visualize conditions as they are in his shop, because it would have meant a line at each wheel continually. We must accept it, however, or else accept the fact that where the men grind their own tools, they use them without grinding longer than they should. As a salesman would say, "Just this one feature alone is worth the price" that laying out such a system costs.

Leaving a measure of discretion in management to the man himself does not necessarily mean that the foreman shall remain ignorant of what the man is doing. In Fig. 20 is shown an indicator on the crossrail of a 100-in. boring mill. Secured to the housing, but hidden by the rail in the illustration, is a table of planned feeds and speeds for different jobs. Whenever the operator changes his job he changes the indicator to agree with the chart. If for any reason he is unable to use the planned feed and speed it is apparent to the supervisor.

This practice illustrates the difference between the methods used here and in most other shops. Most men object to time study; some actively, others passively. If the foreman, or worse still, a time study man, should set the indicator, it would be considered mandatory and would incite passive resistance. Little or no attention would be paid to it by the men, and the practice would die out. When the man himself uses the indicator to show that he is using the cutting speed planned for the job, or even exceeding it, that is a source of satisfaction to the man himself, and his reaction is the opposite of resistance. At the left on a post is one of the switches for calling the foreman or tool man, as previously described. By means of this switch, not shown in the illustration, the operator is enabled to get what he requires without the necessity of leaving his machine.

The automatic department consists of 16 Potter & Johnson chucking lathes; 4 multiple-spindle Gridley and 4 New Britain bar machines. Each man runs two machines or as many as will keep him fully occupied in loading and unloading. In some instances, where two or more operations are done on the same part, the machines used are side by side with a trough connecting them. In other instances they are across the aisle from one another so that the operator can keep his eye on both at the same time.

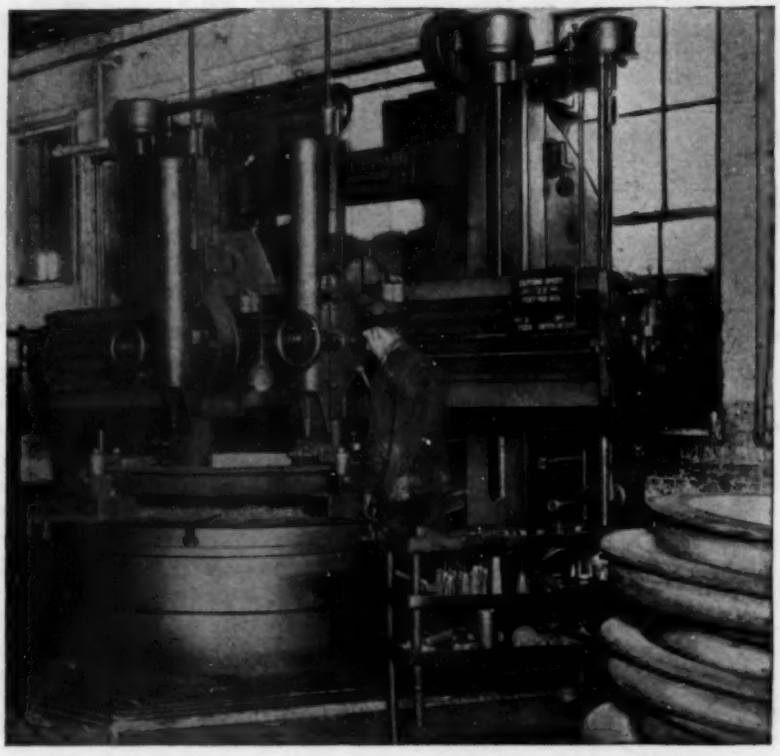

Fig. 20—Indicator showing the minimum speed and feed at which a wheel should be turned. The operator sets it himself

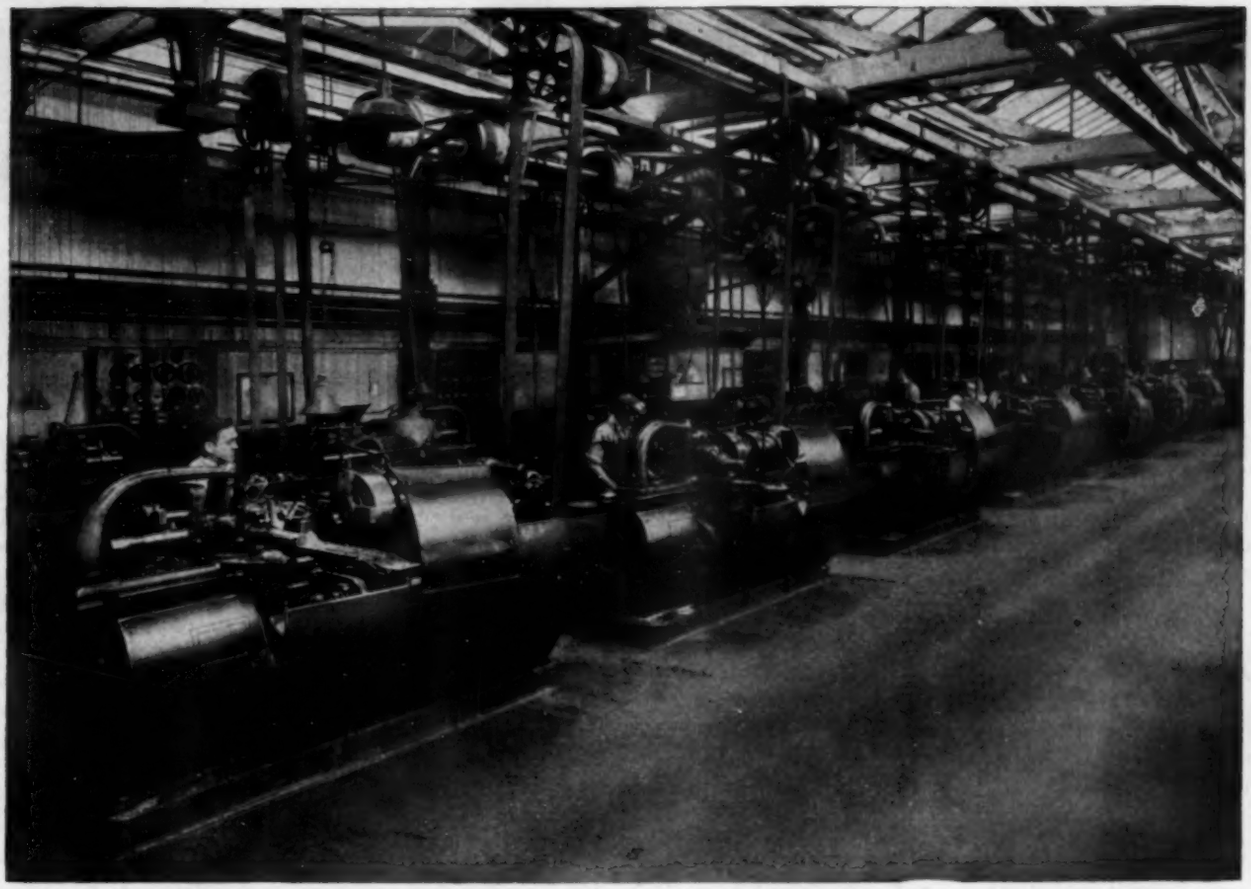

**Fig. 21—An example of straight manufacturing where it is justified. Note tool and gear boards on the wall**

In the same room with the automatic machines is the valve motion department. This forms a contrast, because each operation is special. With the many different kinds and sizes of locomotives that come in for repair, it has been found inadvisable to stock finished bushings. The pins are always turned to even thirty-seconds of an inch, but the outside diameters and the length of bushings vary; hence, each one is a fitting job.

Some of the equipment in this department is up-to-date and some of it is old. No great sum of money was spent for new machinery. They made the most of what they had. Every shop executive will remember the trouble he used to have keeping track of the change gears for his old type lathe. I gave this problem much attention at one time, but never evolved anything as simple and effective as the rig they use under many a lathe, where the gears are strung on a stud projecting inward from one leg.

When a visitor finds so many shop problems solved, and so many indications of efficiency, he begins to look for a weakness somewhere. For my own satisfaction I made it a point to be on hand at starting time in the morning and observed that workers remote from the place where I was started work promptly. At quitting time the problem was more difficult, as the word would be passed that the "boss" and a visitor were in the shop. I mentioned this to the assistant superintendent and he invited me to watch the air gage in the power house. This tell-tale showed that the use of air continued right up to quitting time.

It is only fair to say in conclusion that my attitude at first was skeptical about the practical application of some of the methods used at Mt. Clare, and I sought for and found corroborative proof before accepting the practicability. The photographs, with one exception, are not posed, nor is the shop in an unusually orderly condition. Obviously it would be impossible to make special arrangements without interfering with the daily "three in, and three out."

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## Hurrah for the "Mike"!

JOHN HOMEWOOD

A SUBCONSCIOUS potentiality, acquired by years of micrometer using, recently revealed itself when checking up on some of the answers coming from my students. It so happened that the number of questions submitted was sixteen. The correct answers denoted the usual numerator of the fraction to be expressed in equivalent percentages. A student, whose paper I had just corrected, inquired as to how the percentage was derived. After giving my explanation I proceeded to check other papers with a facility that seemed to arouse a certain admiration. "Gee, you can divide!" he said.

"I'm not dividing, boy," I replied, "I'm just putting down the answers."

I then explained that the repeated use of a micrometer in previous years had resulted in my quickly recalling decimal equivalents to fractions having denominators of sixteen.

# EXECUTIVE FORUM

## Is Interest Important?

DONALD M. GRAHAM, president of the Viking Tool Company, frowned at the report on his desk. Reaching into his drawer, he pulled forth a similar form and compared the two. Then he touched a buzzer.

To the girl who appeared a few moments later he said, "Miss Nielsen, please ask Mr. Doring to step here for a few minutes."

"Mr. Doring, I am disappointed in this statement," said Graham when the company's treasurer arrived. "At the first of the year, I particularly cautioned all concerned to keep down our inventory. I agreed that to fill our requirements it could not be materially reduced, but I knew that our board would not want to see an increase. Now I find that our finished stock is larger."

"I've investigated that figure, Mr. Graham, knowing you would question it," said Doring. "I found that our finished stock inventory is practically the same as on December 31. The rise in dollar value is due to the change in figuring costs."

"So that's it," said Graham. "When I O.K'd the proposed accounting changes, I thought we were simply adopting a few new bookkeeping kinks to keep up with the times. I don't yet understand why our inventory value should rise. The parts in stock have not cost us any more, and those added should not cost more than the equivalent amount withdrawn for sale."

"This is the way it works out," Doring explained. "Formerly we figured in our costs direct labor, material, and overhead which allowed for depreciation on our plant and equipment but excluded the interest on the investment. Now that we've added interest to our overhead, new parts going into stock bear this increased charge, and to preserve uniformity we adjusted the old stock on the same basis. The result was to increase the inventory book value."

"I don't claim to be an expert accountant," said Graham, "but on general principles, I'd oppose any change that would increase overhead and inflate inventory values,—especially where no real outlay is involved. I had no idea that this would result from our accounting changes. It was put up to me as a method to obtain more exact costs."

"So it does," said Doring. "It enables us to ascertain machine-hour rates correctly and to provide an adequate return on capital apart from profit. Economically, interest is a true cost although not always a cash outlay. If we rented the plant instead of owning it there would be no room for argument."

"Your theory sounds interesting, but aside from the accounting viewpoint, what is its practical value? We haven't increased our prices, and since our costs are higher, it must follow that our profits are lower—higher overhead, larger inventories, and lower profits."

"Our real profits are no less," said Doring. "When we used the old method we simply fooled ourselves. The money invested in this plant is just as vital a commodity in the manufacture of our product as the material that goes into it. When we omit to include suitable charges for this investment, we get deceptive cost figures. We also make it difficult to judge the merits of buying new equipment and making other plant improvements."

"My experience in this business is that prices are controlled by competition in spite of our accountants," said Graham.

"There's nothing more demoralizing to an industry than ignorant competition resulting from false cost figures. When concerns making the same line standardize on sane costs, we'll still have competition but not the destructive kind."

**Topic suggested by Thomas B. Frank, Treasurer, Cincinnati Planer Company**

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### What Do You Think About This Executive Problem?

**Cost finding methods are receiving a constantly increasing amount of attention. Some people go so far as to lay many of our industrial ills to poor accounting practices. The opposite view is that, while costs are an important adjunct of business, their compilation has little effect on profit.**

**Whether or not to include interest on investment in cost is a point of discussion. What is your opinion on the question?**

# . . . Discussion
## of Executive Problems

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### Jigs By Whom?

It is reasonable to expect that a tool designer knows the machine for which tools are to be made and keeps up-to-date on attachments and small tools through the medium of trade journals and catalogs. Mentally he is equipped to attack a tooling proposition by the most direct and economical method. With fixtures, proper attention will be given to holding, chip clearances, and possible springing of the part. Stock patterns will be used to advantage, clamps will operate speedily, parts will be held in best position for the cutter, and the proper type of cutter will be designed. With designed jigs, bushings will be of the proper length and distance from the work, jigs will not be of excessive weight, the part will load and eject easily, and dimensions will be given from the toolmaker's point of view. Cut and try methods, adopted in emergencies, often result in demonstrating that haste is waste.

Of course, there are points in favor of either method. It is easy to criticize after tools are completed, but there are two outstanding advantages which would favor designing. First, tool designs and patterns can be prepared in advance while other work is in process. Second, as a tool drawing is more or less of a permanent record, changes in parts affecting tools can be taken care of in the engineering department without interfering with manufacturing department production.

—J. A. Potter, *Chief Draftsman, Singer Manufacturing Company, Bridgeport Factory.*

### Jigs By Whom?

Except in very small shops, employing ten to twenty men, the engineering division seems to be the logical place for this work. If it is proper for the shop foremen or the superintendent to supervise tool design, why not go a step further and have them supervise the design of the company's product and do away with the engineering divisions altogether?

I believe the ideal arrangement is to establish a system of complete co-operation between the two departments, allowing the tool designer free range of the shop. If the designer is a man having shop experience, he will produce better tools than one without this experience. He will also be better fitted for this work than either the foreman or the superintendent. These men often have good ideas but are unable to put them on paper. A man can be a topnotch mechanic and still be unable to originate a complicated design and make the necessary calculations.

On the other hand, any first-class draftsman will not always be able to finish a tool job without considerable coaching, unless he has had some years' experience in the shop. Good tool designers are not all artists, when it comes to producing a high-class drawing. We make radical departures from standard practice on engineering drawings, in order to save time and tool-design expense. For this reason, many short cuts and unconventional methods have to be used.

If the shop were to have charge of this work, it would be necessary to organize a force of tool designers and duplicate facilities that already exist. In the average large machine shop, the design of jigs, fixtures, and tools, and the necessary records connected with this work has so many ramifications that I think the foreman or superintendent with designing ambition would gladly throw over the responsibility within a month if they had to carry on the work in addition to their own.

—H. L. Wheeler, *Tool designer, U. S. Hoffman Machinery Company.*

### Should Price or Payroll Be Cut?

In an emergency such as Galloway faced I believe it is a wise policy to sacrifice a little profit to hold an efficient organization together. Of course we can see Norton's argument, and it is decidedly unwise to run at a loss even in a time of stress; but far too much overhead is charged in many plants, killing all chances of getting work that is urgently needed.

Without profit no business can continue, but it is far better to keep an efficient force together and make only expenses, than demoralize the organization by laying off men.

—Wm. C. Betz.

### Success or Successor?

If the chief executive happens to be the owner or president of the company, the dictates of common sense would demand that he break in someone who would absorb a certain amount of the load while the chief is there and be capable of keeping things moving when the chief is away. I know, personally, a man who is sole owner of a factory. His is a one-man régime. When he is present he drives; but when he is away, as he often is on selling trips, the shop is obliged to mark time as there is no one present who can do the "executing." I knew another factory owner who would never let anyone else acquire his skill; he was the ace-high arbiter of all the factory's policies. He finally became advanced in years and sickened; the others did the best they could, but the business went gradually down hill and when the owner died it went out. What might have been continued as a thriving business was only so much salvage to be sold to the highest bidder.

For a hired executive who may possibly be "bumped," as they say in railroad circles, there is more room for discussion. If the executive expects to go higher up, it behooves him to break in an understudy, who may relieve him of monotonous details and give him a chance to concentrate on the bigger things of the business. True executive ability consists in getting the people under one to do the work. Executives are for thinking, not for work that a clerk can do. If, however, the hired executive feels that he has reached the top of his ladder and the next step would be into the great outdoors, it would

seem logical for him to retain a certain amount of exclusive knowledge—not to let the underlings in too deeply, but to hold the grip on his own job. It is possible, of course, to go too far with this kind of a policy. An executive that refuses to teach his employees will soon have a set of dumb-bells working for him.

—GLEN MACOMBER.

## Should Overhead Be Uniform?

There are many plants where the machine centered system of calculating overhead is the logical one. In fact in a plant where planers, heavy millers, and boring mills are segregated in one department, auto screw machines in another, and gear cutters in a third, the cost of each will naturally be calculated separately. It is obviously quite illogical to make the same charge per man-hour (say $2.50) for small brackets made by a smith and mate on the anvil as for turning a 20-ton shaft in a lathe costing $60,000 and consuming 100 hp.

While there are many large plants where such contrasts can be found, there are nevertheless many more smaller general engineering shops where the equipment is such that they do not occur and where an accurate determination of separate costs for different types of machines is an extremely difficult matter. It is useful, however, to estimate separate hourly burdens for the different machines, and check over estimates on jobs which call for the use of either expensive or inexpensive equipment and make such allowances on the price as seem wise.

The mentality of the customer must also be taken into account. There is no point in annoying a perfectly good but conservative customer from whom it is possible to get back on the capstans what one loses on the planer simply to satisfy the requirements of an up-to-date cost-keeping system. —H. JAMES, *Birmingham, England.*

## Is Incentive Necessary?

Yes, of course it is. Without the inducement of increased earnings, be they in the form of a premium plan or in another way, no worker will do his best.

Further I think it will be difficult to obtain a clear idea of the best possible output of the shop if wages are paid at a fixed hourly rate. Bill Holland is quite right if he means that, with this method of remuneration there would be no measure of the workers' output. Piecework in common with a bonus system is in my opinion in every respect the best for both the employer and the worker.

Another question is whether in all cases it is possible for work to be arranged on a piecework or premium system. These methods go with all real production work, but on complicated tools and jigs to be made singly or on repair work, I think the fixed hourly rate is preferable where there are experienced workers who know how to handle their work. —ADOLF STEMWEDEL, *Engineer, Karger Machine Tool Works, Berlin, Germany.*

## Who Should Control Routing?

Here at our plant, we experimented with various methods of routing our production for a considerable length of time, and here is the method which we finally decided was the best. Incidentally it has proved to be as nearly perfect as any I have ever seen or heard of.

The head of our production department is a member of the factory executive committee, which meets once a week and discusses the needs, as far as production is concerned, for the following week. He makes out a schedule, with the help of the shop superintendent, which he passes over to his "stock chasers," it being the duty of these men to follow every job on their lists right through the shop to completion and to the shipping floor. Whenever a chaser informs a foreman that he is to give preference to any certain job, the foreman knows that this is absolutely essential and is being done with the knowledge of his superior, the superintendent. By using this method of co-operation between the two department heads, it is almost an unknown thing to hear of an order not being delivered on time.

—CHARLES R. WHITEHOUSE, *Standards Engineer, The Holtzer-Cabot Electric Company.*

## Should Spending Be Influenced?

While every effort should be made to stimulate business, the question of advising employees regarding the building of homes should be given careful consideration before taking action. Length of service with the company, loyalty, and the prospects of future employment, must always be considered. The small concern whose future is uncertain, would do well to avoid any commitment in regard to financing or influencing house building or other purchase schemes for their employees. Only the long established concern whose future seems assured, can guarantee to their workers a reasonable prospect of continued employment. When the average man is assured of this, only then will he consider building a home.

With these considerations favorable to employee and employer, company owned or "interested" houses form an added bond of loyalty between workman and employer mutually profitable to both. In British industry, I have found that company housing schemes attract the better grade of work-people with the family spirit predominating in the relations between employer and employee. —ROBERT S. ALEXANDER, *Universal Winding Company.*

## Who Should Do the Firing?

The best practice I know is carried out at one of the large and reputable firms in Birmingham. A superintendent or head-foreman engages, fixes remuneration, transfers, promotes, and dismisses. All departments come under him, and the behavior of every employee is noted by him. He has a weekly report from each foreman, and knows every man as a shepherd knows his sheep. Education, natural intelligence, ability, ambitions, and dispositions are all known and taken into account. He is accessible to any with a grievance, and all have a fair hearing.

Being in touch with all departments, transfer of men for any reason is soon arranged, and he knows the most suitable man for any job. The supply of a new foreman offers no difficulty—he has plenty of ambitious fellows waiting for an opening. The writer has never seen a shop where there are so few changes. Dismissal is exceedingly rare, and those who leave do so to take up foremen's jobs elsewhere. —WILLIAM BRYCE, *Sheffield, England.*

# Fins for Unit Heaters

P. H. WHITE
*Mechanical Engineer*

A SPECIAL type of radiation for use in what is known as a "Unit Heater," is shown in the illustration at A, Fig. 1. It consists of a single loop or return bend of commercial steam pipe, upon which is attached at equally spaced intervals a great number of thin steel fins. One of the fins, or disks, is shown at B. The object of these disks is to multiply the radiating surface of the original pipe.

At the first conception of this type of radiation, a number of interesting problems presented themselves. It was necessary to know the economical size to make the disks, the correct allowance for a press fit upon the pipe, the proper hardness and gage of material, and the spacing that could be used to best advantage. Each of these questions required much concentrated study and more or less experiment before it could be answered with any degree of satisfaction. It was found, for example, that with too soft a material, and too great a press-fit allowance, the fins would be stressed beyond their elastic limit, which resulted in leaving them loose upon the pipe. With too heavy a gage, the pressure necessary for assembling caused many of the pipes to bend under the column action.

Another most vital problem was the development of some suitable means of spacing these fins upon the pipe at a rate that would be commercially practical. This problem, after considerable experimental work upon short sections of pipe, led to the development of the machine shown in Fig. 6. Before describing the machine, however, it might be well to give a description of some of the principal detail parts, after which the action of the complete machine can be better understood.

Having determined upon the proper size and gage of fins to be used, and the correct temper, the next step was to design a holder, or spacing die, which would give them the proper location upon the pipe. As these return bends ranged from three feet to a maximum of seven feet in length, it will be understood that the spacing die must be of quite a formidable size.

In Fig. 2 is shown one of the units which go to make up the completed die. It consists of two half-disks having a thickness equal to the desired spacing upon the pipe. Through the center is an opening slightly greater than the outside diameter of the pipe. Concentric with this is an angular counterbore having an outside diameter twenty to thirty thousandths of an inch greater than the outside diameter of the fin. Half way between the counterbore and the circumference, and just back from the mating faces of the two halves, are two small holes.

A short section of the assembled spacing die is shown in Fig. 3. The casing *D*, is a half cylinder with an inside diameter equal to the outside diameter of the disk of Fig. 2. This casing is made by splitting a selected piece of seamless drawn tubing that has the correct inside diameter and a wall thickness that will give the necessary rigidity. The half-disks are strung on two cold-drawn rods *E*, which fit the holes *C*. These rods are threaded at one end ,and have flat countersunk heads on the other.

In Fig. 4 is shown the assembled die, consisting of the

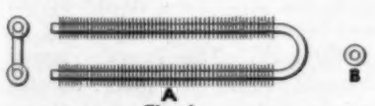


Fig. 1

Fig. 2

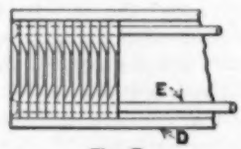


Fig. 3

**Fig. 1—Hairpin section of unit heater**

**Fig. 2—Spacing disk, composed of two halves**

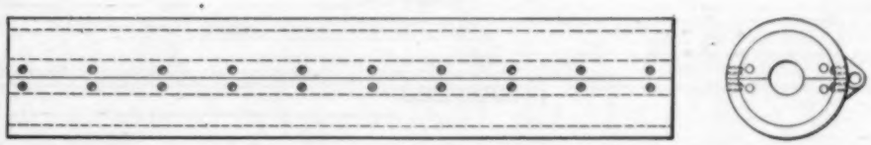


Fig. 4

**Fig. 3—Spacing disks assembled in casing**

**Fig. 4—Casing for spacing disks**

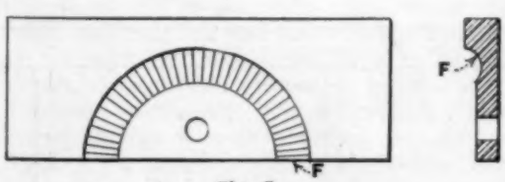


Fig. 5

**Fig. 5—Part of clamp to hold hairpin, serrated to prevent creep**

two halves of Fig. 3 hinged together. The hinge lugs are attached to the casing either by screws or by brazing. In one particular instance where the lugs were brazed on, the die was found to be warped so badly that it had to be straightened before it could be used. This could no doubt have been avoided by properly clamping the die until it had cooled after the brazing.

The finishing and assembling of the spacing disks was of itself no small problem. On account of the great number required, it was decided to produce the blanks upon a punch press. The material selected was cold-drawn strip steel about $\frac{1}{4}$ in. greater in width than the diameter of the disks, and of a thickness just equal to the required spacing. The die is of the progressive type in which the first stroke of the press punches out the two small holes and the center half-hole, while the next stroke punches out the complete blank. In order to index correctly after the first stroke, the large blanking punch carries two pointed pilot pins which enter the small holes punched at the first stroke.

THE first process after the blanks have been cleaned of oil is to straighten any that have been deformed, and remove all burrs. Pieces must be perfectly flat or there will be a "creep" when they are assembled and the two halves will not properly mate. The blanks are then taken in pairs and counterbored in a fixture which also serves as a gage to determine any variation in the pieces, since burrs prevent the two pieces from mating together. A central bushing serves to guide the pilot on the counterboring tool, and a fixed stop insures reaching the same depth on each pair. The work is done in a drill press. No attempt is made to keep the two pieces which were counterbored together mated, as all pieces are practically identical. The only variation which may become serious is in the thickness of the blanks, which is almost negligible in the individual pieces, but is, of course, cumulative in the assembly.

To avoid such cumulative variations, the half-disks were assembled in pairs upon the four rods with one of the thin disks in the counterbore of each pair. At frequent intervals the pieces were drawn up snugly with a clamp, and any irregularities were corrected. When the entire length was completed, the nuts on the ends of the four rods were drawn up snugly, and the two half casings were clamped around the die. To attach the casing firmly to the die, four rows of holes longitudinal along the joints were drilled and tapped for shallow set screws. The drill entered a short distance into the disks, but not deep enough to enter the counterbores. When the setscrews were screwed in, they locked the casing and the die firmly together. The hinges were next attached, the die still being clamped tight shut, thus insuring alignment.

Referring again to the disk in Fig. 2, it will be noted that the counterbore is at a considerable angle to the face. The purpose of this is to reduce the pressure required to force the pipe through the die. The disc is held in place in the counterbore by the circumference. When the pipe starts to enter, the pressure at the center causes the fin to dish forward so that only the rear edge of the center hole comes into contact with the pipe. When the trust is removed, the fin returns to its position normal to the axis of the pipe. The amount of clearance given to the pipe has a decided influence on the ease of assembling. Too much clearance will allow the fins to be dragged through the pipe and more or less deformed, while too little clearance will greatly increase the amount of power required.

During the assembling operation, it is essential that the return bends be held securely. Fig. 5 shows the lower half of the clamp designed for this purpose. The semi-circular groove *F* is made to fit the closed end of the return bend. The radial lines shown in the front view represent shallow teeth cut in the face of the groove to resist any unequal trust against either leg of the bend. It was found that at times the pipe had a tendency to creep through the clamp, resulting in one leg of the bend shortening and the other lengthening during the operation. This difficulty was overcome by adding teeth to the clamp. This lower half is made to slide between the guides of the machine just ahead of the crosshead, but is not attached to it. The upper half is identical with the lower except for being somewhat shorter so that it clears the guides, thus permitting it to be lifted off for inserting or removing the bends. Both parts are made of tool steel hardened to resist wear. The two halves are held together during the operation by an eccentric clamp.

TO prepare the pipe for the assembling operation, it is run in full lengths through a swaging machine which reduces it to a uniform size. It is then bent and cut to the required length, and the open ends are chamfered slightly. Two pilots, one of which is shown in Fig. 7, are now inserted in the open ends of the bend, and it is ready to be placed in the clamp. The pilots, which are of hardened steel, are used to equalize any irregularity in the location of the fins in the die, and to bring them concentric with the pipe as it passes through.

Returning now to Fig. 6, the machine consists of the two spacing dies *M*, with some mechanical means of forcing the return bends through. The frame consists of two structural steel channels bolted to a spacer at each end, which gives them the necessary spread and also provides a member to take the thrust of the dies. This

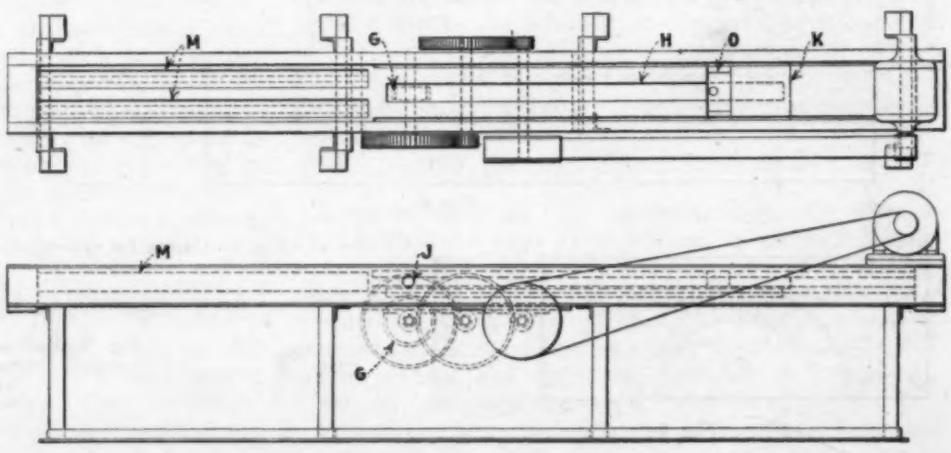



**Fig. 6—Type of machine developed for assembling fins to hairpin pipe**

frame is supported upon four pairs of structural steel legs. The two spacing dies are mounted at the front end of the frame with their forward ends bearing against the spacer block. The driving mechanism, consisting of a train of gears, is attached to the under side of the frame by means of the gear-mounting plate shown in Fig. 8. This plate is a heavy slab of sufficient size to take the entire set of bearings for the three shafts. It will be noted that the forward shaft carrier a pinion *G*

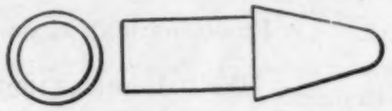


**Fig. 7—Guide pin used in open ends of hairpin**

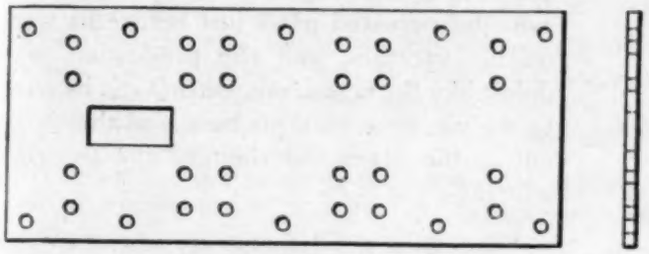


**Fig. 8—Layout of bedplate of assembling machine**

at the center. This is the main driving pinion which meshes with the long rack *H*, to which the crosshead is attached. The small rectangular opening in the gear mounting plate, Fig. 8, is to provide clearance for gear *G*. In the side view of Fig. 6 is shown a small roller *J*. This is mounted just above the rack *H*, and serves to hold it in mesh at all times. Without some such provision, the rack would lift out of mesh under a heavy trust.

The guides are rectangular bars of cold drawn steel bolted to the inner webs of the frame. The rack *H*, is attached to the crosshead, which gives it the required reciprocating motion. As mentioned before, the clamp *O* is mounted in the guides, but is not connected to the cross head. This allows the clamp to be moved to any desired position for attaching to the bend, independently of the position of the crosshead.

The driving motor is mounted at the rear of the machine, and power is applied to the driving train by means of a belt and pulley.

No satisfactory mechanical means of loading the dies has yet been developed. Hand loading seemed at first to be very slow and laborious, but after a short period of training, the operators developed skill and speed.

■

## Mirrors in the Machine Shop

IN AN article under the above title in the European edition, *American Machinist*, Philip Monroe describes the application of mirrors in a shop as an aid in maintaining production. It was noticed that a man operating two machines would often interrupt the rhythm of setting up on one to ascertain how far the cut had proceeded on the other, and that where one of the machines was in back of him, it not only took a considerable amount of time from the setting up, but also introduced an element of danger. The difficulty has been solved by placing mirrors in such positions that the operator can ascertain the progress of the cut on the other machine simply by glancing into the mirror in front of him.

# NEW BOOKS

PRINCIPLES OF ENGINEERING ECONOMY—*By Eugene L. Grant, A.M., C.E. professor of industrial engineering, Montana State College. 387 pages, 5⅝ x 3⅜ in. Indexed. 12 charts and 32 tables. Cloth boards. Published by The Ronald Press Company, 15 East 26th St., New York, N. Y. Price $3.75.*

Despite the wealth of literature dealing with shop management and business administration, systematic treatises on problems of engineering economy are few. Yet such problems are being dealt with daily by production executives, engineers, purchasing agents, sales engineers, accountants, and controllers. This book, planned primarily as an engineering school text to emphasize the economic aspects of engineering, is in addition a systematic treatise that will prove worth while to the industrial executive or engineer. Quite as definite a set of principles governs the economic aspects of an engineering decision as governs its physical aspects, and it is these principles which are presented, not in theory but in actuality. So far as is possible, principles of cost comparison are illustrated by a discussion of particular cases rather than by mathematical formulas.

The text has ample additional references for those who wish to delve more deeply into the subject, presented in lists at the end of each chapter. Typical chapters are: What is Economy?; Will an Investment Pay?; Depreciation as a Factor in Economy Studies; Comparisons of Ultimate Economy; When Should a Machine or Structure be Replaced?; Technique of Estimating Costs; Technical Fact Finding and Research; Judgment Factors Related to Forecasting; and The Human Element in Judging Economy.

INDUSTRIAL STRUCTURE OF NEW ENGLAND.—*By Charles E. Artman of the U. S. Department of Commerce. 591 pages, 6x9 in. For sale by the Superintendent of Documents, Washington, D. C. Price $1.30.*

The greater portion of this timely book is devoted to a detailed analysis of the manufacturing industries, although agriculture, fisheries, etc., have been given considerable space. It shows the general condition of New England's industrial life, its trend in recent years, and its place in national affairs. Among the maps are those showing the interconnections between public utilities, the distribution of New England's manufacturing industries, and the shifts in population by counties.

In addition to presenting graphically and statistically the relative importance of leading industries of New England, and of the individual states, Mr. Artman gives considerable information (for the leading industries) concerning branch-office practices, materials used in manufacture, management methods and policies, locations of markets, trends of sales, employment conditions, etc. This volume, together with an analysis of New England as a consuming market in "Commercial Structure of New England," and a third volume "Market Data Hand Book of New England," probably provide the most comprehensive study of the economic structure of New England ever undertaken.

# The Foreman's Round Table

## KEEP OUT

"ED WAS sitting on the front porch watching his wife spray rose bushes, when Al came along on his way to work. After the usual attempt on Al's part to get Ed into hot water with his better half, they started for the shop.

"Say, Al," began Ed, "You don't want a job as superintendent, do you?"

"You remind me of one of my brothers when Dad told him it was time he got out and earned some money for himself. Under much pressure he went to the different places in town and made application. He always worded it: 'You don't want to hire no one today, do you?' And of course he never got a job, because the negative was automatic. Now, which do you mean? Do I want a job, or don't I want a job?"

"I mean, do you want a job as superintendent of a plant, said plant being the pump works. The alleged trouble with the present incumbent is that he had a run in with the vice-president in charge of manufacturing and quit cold. At least, that is what Joe Black tells me. Does that statement percolate?"

"Partly. But they had a good man, and how could I get by with their vice-president if this other fellow couldn't?"

"Well, I do have to pay you a compliment once in a while. You have got sense enough not to buck. I do it all the time but you never do, so you would fit in with this other guy, and it would give you a darn good boost besides."

"Thanks for the compliment, but what is it I must not buck against in this case?"

"Well, Johnson, that's the super's name, rearranged the sequence of operations on some heat-treated parts just before he went on his vacation, and the production man didn't like the new arrangement. So he went to the vice-president, his boss, and they went out in the plant and changed the sequence a little."

"And what did Johnson say when he came back?"

"Nothing, but the dam fool went and changed the whole thing back again, and the production man told the V.P. The V.P. sent for Johnson and they tangled badly, I understand. Anyway Johnson quit or was fired, subject to the approval of the general manager when he returns."

"And so you think I would work under a man that would pry into my affairs while I was away? Not for a minute. Good for Johnson!"

"There you go; 'little tin god' stuff. No one must look at my sanctum sanctorum unless I am there to defend it."

"Just that. My department is a reflection of myself, applied in the way Williams has directed or approved. I will change it any way he wants me to, but it must be me that does the changing if it is going to be my department."

"Well, I don't care what they do with mine while I am away, and I don't take no job as vice-president if I can't do as I please."

**We have no method of visualizing actual conditions is a department, but good management demands that the superintendent know what is really going on. If he investigates during the absence of a foreman, should he make changes at once or await the return of the foreman?**

# ▸ ▸ ▸ Discussion of Former Topics

## Vacations Again

Those entitled to vacations should ask for the time they want prior to the vacation period. Where a conflict occurs, the management should assign vacations according to seniority.

The number of foremen who should be absent at one time depends upon the size of the shop and the number that can be spared at the same time. The fewer off at the same time the better.

The clerical force and the salaried men in the shop should receive vacations. I do not think that a man who is paid overtime should expect a vacation. A vacation should be in the nature of a reward for putting in extra time in the interest of the firm.

I do not believe a total shut down is feasible, as orders are always coming in that must be filled as soon as possible.

—J. Walter Wright, *Assistant to the President, Wilmot Fleming Iron & Steel, Company.*

## Old Kinks and New Ideas

To the problem of how to keep track of the various shop notes and kinks that appear in the various magazines so that they are available when required, the scrap book seems to be about the only answer. However, as there are often articles on both sides of a single page that it is desired to keep I have resorted to the expedient of retaining the whole page or pages I am likely to want.

I take the magazine apart, after reading, by grasping bunches of pages and pulling them off the back side until I get down to those I wish to retain. I start taking the back pages off first, because the staples are put through from the front. By pulling the back pages the staples are opened up so that when the front pages are pulled the staples come out, leaving these pages loose.

The pages I wish to keep are stacked up. Those containing shop notes and kinks are kept separate from those containing longer articles. It is my intention to group the notes so that some sort of index can be made in a note book. Tabs of paper placed between the pages at intervals and dated the same as the pages will also help. Even by stripping away all of each volume except the pages desired, the pile has acquired formidable proportions, but so far, I can think of no better scheme.

—George Wilson.

## Government Work

This touches all workers more or less; few are without sin in the matter. It will probably never be stopped entirely. Bosses do not see all, and this is well, for "What the eye does not see, the heart will not grieve over." One man does the job while his mate looks out for the foreman. If he turns up, both men are working assiduously.

Government work for outsiders should certainly not be permitted, nor should it be permitted for making models of inventions, a fault into which the writer fell while a young man. Neither should the lunch period be disturbed by noisy jobbing. Moreover, time is sometimes spent making paltry things which could be bought for a few coppers. A line must be drawn or private jobs would be become too regular.

There is reason in everything. A man making bolts and nuts should not be debarred from using one for his garden gate. Surely he can make a spring for the door lock, or sharpen and rivet a pair of scissors for his wife. "Thou shalt not muzzle the ox which treadeth the corn," aptly applies here.

—William Bryce, *Sheffield, England.*

## Honest Graft

The foreman should be interested enough in his work, and should think enough of his connection with the company, to be willing to give an hour or so of his time in order to attend the meetings. If the foreman has the "I-don't-care attitude," then it is high time that a new foreman was found for that department. It is the old case of a man who thinks he knows it all and does not need any new ideas.

If this same foreman had to go without work for three or four months, his tune would change. What do a few hours matter? Should people be so miserly with a few hours of their own time, when, I'll wager, they waste a good many hours which rightfully belong to the company.

If the foreman would rather sleep, well, that is his lookout. Only it might turn out the same way the race between the hare and the tortoise did. As a rule, people want to learn about different things, and get new ideas. It seems to me that they should be willing to sacrifice a little time to better themselves.

—Maurice H. Baitler, *Perkins Machine & Gear Company.*

## Foremen and the Wage Bonus

In the opinion of the writer, the foremen's bonus is unsatisfactory for a number of reasons. If based upon the quantity of production, it is apt to prove too great an incentive to unwholesome driving and speeding up of the workers in the department. If used in conjunction with a wage incentive plan for the workmen, the quantity of production will generally take care of itself. Used without the wage incentive, the foremen's bonus is misplacing the reward. Quality of work is bound to suffer when production is speeded up unless there is some positive check such as that a foreman without a quantity bonus affords.

A bonus based on factors of indirect expense is perhaps logical theoretically. However, the difficulties in determining and measuring these factors are often so involved that the foreman is apt to misunderstand the real purpose and the underlying policy. With such a bonus, the foreman is apt to make apparent savings

which in the long run may prove a loss. An example of this would be the cutting down of quality and quantity of machine oil with the result that a yearly saving in machine oil would be effected, but in several years time the indirect and less measurable result would be premature deterioration of machine equipment.

To base the foreman's wages upon factors which, for practical purposes, must be narrowed down to a few obvious and concrete items is perhaps denying the broadness of perspective which should characterize a good foreman. Moreover, it should be the company's right to demand the best of its foremen for every hour that is spent in the plant. It may then be assumed that the amount of work done by the foreman is dependent upon the amount of time spent in the plant, and payment by the hour would seem an equitable incentive for extra work.

—M. F. SAXTON,
*Allis-Chalmers Manufacturing Company*

## When Personal Tools Are Damaged

If damaged personal tools are replaced by the company in one case, justice and the men both argue that they should be replaced in all cases. But this practice would be taken advantage of, and no company can afford to adopt it as a policy.

The truth of the matter is that the possession of dial indicators, micrometers, and fine tools of that nature, is more the result of personal pride in possession on the part of the owner than the means of giving the company any great benefits in the line of better quality of work or increased production. When the work is of such a nature that fine instruments are needed, these are generally available at the tool crib.

No company would replace a draftsman's broken instruments nor would they replace an engineer's damaged slide rule. Most companies will permit a toolmaker to repair his damaged tools at their expense, but that is as far as they can go.

There are times when some of us would like to break the rule, but after having done it once, and having stirred up a hornet's nest we are not likely to repeat it.

—J. K. MATTER, *Supervisor,*
*E. G. Budd Manufacturing Company.*

## Quality or Quantity?

The departmental foremen who feel it is a waste of time to train apprentices more than likely feel the same way about improving the older men under their supervision. A foreman's chief duty is instruction, whether he realizes it or not. It is the one part of his job that cannot be handled by a cheap clerk, and, therefore, should be one duty he feels proud of and inspired to do well.

Whether or not apprentices should be segregated depends a great deal upon the number undergoing training. If the group is sufficiently large to occupy the entire time of one or more instructors, and the plant is so laid out as to permit their separation, by all means do so until they reach a degree of skill sufficient to enable them to step into the production line without causing undue loss or delay. A separate repair part department is a good place to use for this preliminary training.

Apprentices should be trained from the start to acquire speed. Motion study experts tell us we do not use the same motions for performing operations at varying speeds. For this reason, correct speed should be taught from the very beginning, so that correct motion habits will be developed at once. If this is not done, incorrect habits will be formed. These will need to be broken and new ones acquired—all of which adds to the length of time required for development of the skilled worker.

—W. B. LINCOLN, JR., *Chief Engineer,*
*W. J. Savage Company, Inc.*

## Mottoes in the Shop

The main idea in poster advertising is the "putting across" of some idea of service either by compelling wording or by attractive pictures. If the public in general can be reached by the medium of posters, and every indication points to the fact that it can, there is no reason why they should not be successful in industry. Well thought out, various posters on topics of interest, such as thrift, waste prevention, safety methods, etc. will always be read by the average workman and, while it has been my experience that posters of the "too inspirational" type come in for a lot of sarcastic comment by the men, these same men react favorably to any well reasoned statement of fact, especially if it is backed by statistics. From a psychological standpoint, the repetition of an idea, as expressed by advertising, is bound to leave an impression on the mind. In my opinion the value of posters in the workshop will always be measured by the worth of the idea.

—ROBERT S. ALEXANDER.

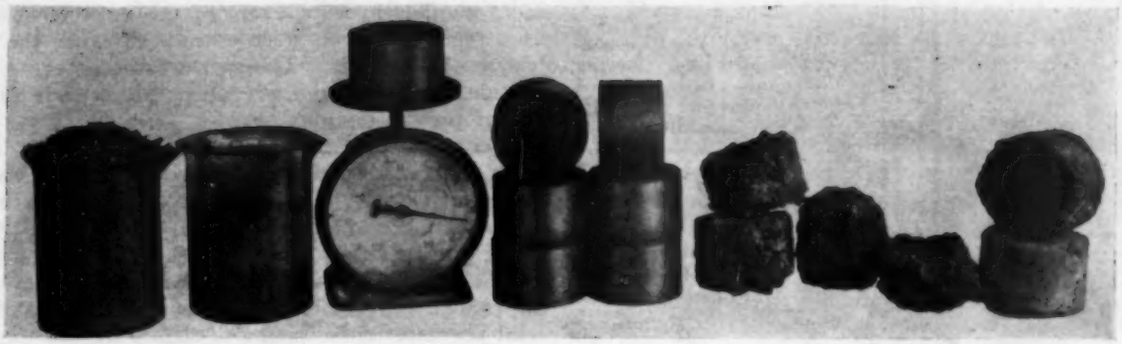
## High Rates

Raising a man's wages to get him to do more work seems a case of putting the "cart before the horse." The majority of workers, no matter how poor the work they turn out, always feel that they are underpaid. As a matter of fact, it has been our experience that the less useful the workman the more he feels that he is underpaid. To him, a raise is no incentive to do better. In view of this it is hardly reasonable to expect increased production out of gratitude for an increase in pay. By making the men conscious of reward for better work it is oftentimes possible to get better results. Therefore, unless there is an improvement in skill or an increase in knowledge of work performed to warrant it, no raise ought to be given.

The piecework system used in large factories is a familiar example of reward for increase in skill. There are many shops, however, where piecework is not done. A man with experience and a good knowledge of the work to be done is valuable to such a shop and should be paid accordingly.

In every shop there are men of varying grades of skill, experience, and intelligence. At the same time, the work that comes in varies as to the grade of accuracy demanded. Each man should, as nearly as possible, be given the work best suited to his grade. Each grade of work has its value and the man should be paid according to the grade of work he does. He should be given a raise only as he increases in ability to do a higher class of work or to perform more efficiently the work of his class. At the same time, better work should be given him to do. Then he will realize that—"Well, as soon as I learn to do what Joe is doing, I can get a raise, too." He will show a willingness to learn because he will realize that any honest effort on his part will be rewarded.

—R. R. WIESE, *Naval Aircraft Factory.*



# Briquetting Cast-Iron Borings

**FRED J. WALLS**
*Chief Metallurgist*
*Wilson Foundry & Machine Company*

**A hydraulic machine has been developed for making a briquette that can be used with marked economy in the cupola, at the same time maintaining a high grade casting**

MANY executives of metal-working shops operating their own foundries have often looked longingly at the mounting piles of cast-iron borings and wondered how they could best make use of this waste. While a number of methods have been devised during the past decade for binding such chips for use as scrap in the cupola, few of them have proven very successful, partly on account of the cost of materials and labor involved, but principally owing to the excessive oxidization losses encountered in the high temperature zones within the cupola. These processes included rusting by common salt, sal-ammoniac, and the like; cementing by the use of water glass, portland cement, and other binders; and canning by encasing in sheet-metal containers.

A few years ago the Southwark Foundry and Machine Company of Philadelphia, Pa. developed a large, automatic, semi-hydraulic press capable of exerting a pressure exceeding 600,000 lb. One of these machines was installed in the plant of Dodge Bros., Inc., at Detroit, for briquetting cast-iron borings. The results were keenly watched by plant managers throughout the country because they had long realized the tremendous loss involved in selling borings at the prevailing market prices as compared to the purchase price of cast scrap or pig iron.

In September, 1928, the Wilson Foundry and Machine Company, after considerable experimenting, and following investigations of the results at Dodge Brothers, ordered one of these machines. At about the same time the Oakland Motor Car Company, Pontiac, and the Buick Motor Car Company, Flint, purchased similar machines. The Packard Motor Car Company, Detroit, installed the smaller type known as the 120-ton machine. More recently there was installed at the Deere & Company plant at Waterloo, Iowa, a combination 300-ton machine for steel turnings as well as cast-iron borings. The Timken Roller Bearing Company, Detroit, has three large machines in operation on steel turnings, and two machines of the same type are working on sponge iron in Japan.

The cost of the machine and equipment as installed in the plant of the Wilson Foundry & Machine Company, Pontiac, Mich., is as follows:

| | |
|---|---|
| 300-ton briquetting machine (includes freight) | $39,158.15 |
| Building (includes foundation for machine, air, water, heating, lighting, drains, etc.) | 2,842.35 |
| Erection of machine (includes labor, engineering services, guarding, etc.) | 1,387.85 |
| Conveyors (includes power lines, motors, control equipment, screen, storage bins, etc.) | 24,338.11 |
| Total Cost of Installation | $67,726.46 |

In Fig. 1 is shown the die or mold which forms the briquette and the two plungers or rams which have the same cross-sectional area and are opposed to each other. One ram is stationary, the other moves back and forth actuated by a powerful crankshaft. The die is formed by a sleeve which also slides back and forth over the stationary ram, being actuated by a rocking shaft at the rear end of the machine. The rocking shaft derives its motion through a set of toggle links shown in Fig. 2

American Foundrymen's Association exchange paper for the Institute of British Foundrymen.

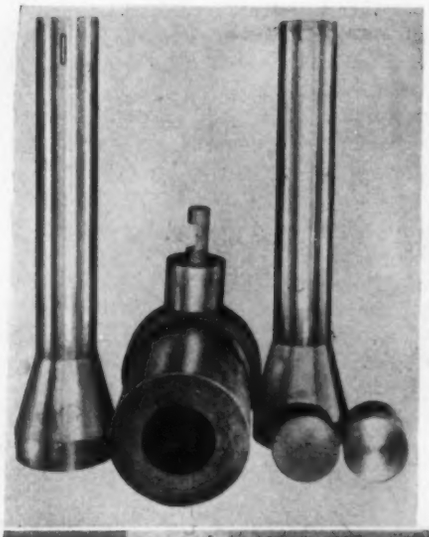


Fig. 1 — Disassembled die, showing the two tipped plungers and the movable sleeve

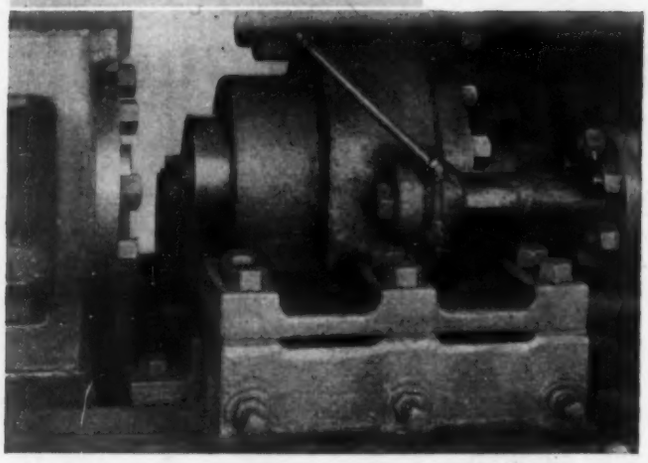


Fig. 2 — Dies assembled in the briquetting machine

and a long crosshead and connecting rod extending from a crankpin on the main gear. Due to the double toggle arrangement, the sleeve die, or mold, has a quick intermittent motion, the balance of movement being absorbed by the toggles passing through dead center.

When the die is in its forward position, it and the stationary plunger form the mold. The moving plunger, which in its back position, allows the borings to fall ahead of it and on its forward travel charges the material into the mold and exerts a total force of 600,000 lb., forming the briquette. As the plunger returns, the sleeve die moves backward also, and because of the stationary plunger, the briquette is stripped from the die and drops out onto a conveyor.

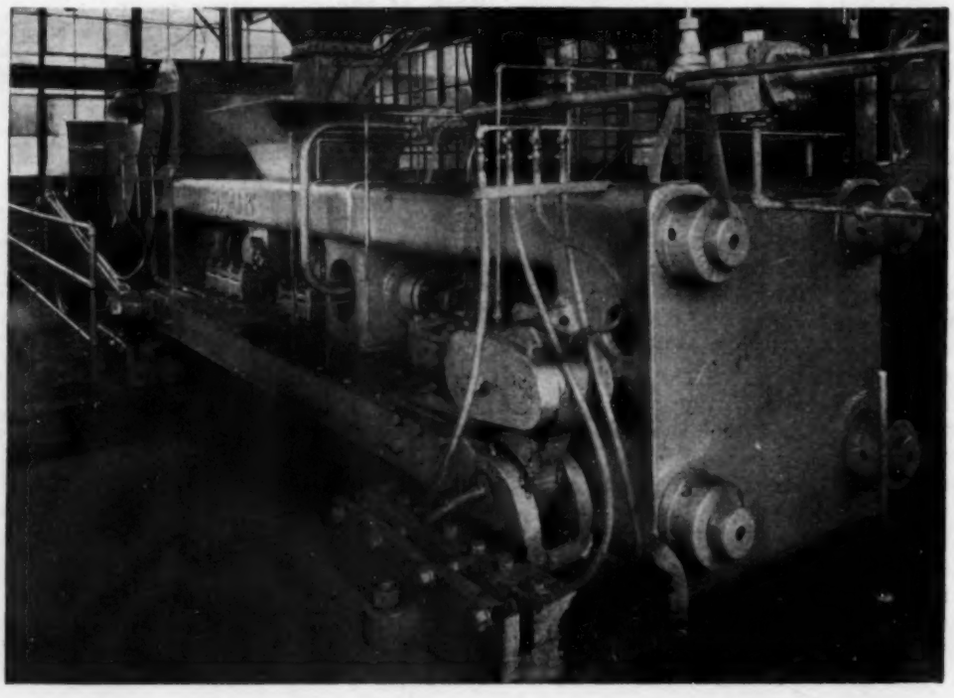


Fig. 3—General arrangement of the machine showing the long crosshead and the toggle mechanism

The main crankshaft and connecting rod actuates a crosshead which carries a hydraulic ram reciprocating in a stationary cylinder. In the other end of this cylinder another hydraulic ram of the same cross-sectional area reciprocates on a crosshead, carrying the moving briquetting plunger. The two crossheads are connected outside of the cylinder by two pull-back rods slidable in one of the crossheads.

The cylinder is connected to the hydraulic cylinder of an appliance known as a "Hydro-Pneumatic Balancer," shown in Fig. 4. This balancer consists of a hydraulic single-acting ram of small area, carrying on the open end a pneumatic piston of large area. Assume that this area is 1,000 sq.in. and that in the pneumatic cylinder an air pressure of 60 lb. per sq.in. is maintained; then the total pressure in the piston is 60,000 lb. If the area of the hydraulic ram is 10 sq.in., then in order to balance this total pressure, a hydraulic unit pressure of 6,000 lb. per sq.in. must prevail in the hydraulic system. If the area of the hydraulic ram in the press is 100 sq.in. and the pressure in the system is 6,000 lb. per sq.in., the total pressure on the press ram must be 600,000 lb., 300 net tons, in order to affect the balancer.

THIS arrangement permits the maintaining of the maximum pressure on the briquette constant for a certain angle of revolution at the extreme forward position of the crank and is very important, due to the variation in size and conditions of the cast iron borings, as shown in the headpiece. The instant the pressure is built up to 300 tons, the water passes into the intensifier and the briquetting plunger stops. While the balancer is acting, the pressure on the briquette remains constant. This "dwell" period is adjusted by lengthening or shortening the pull-back rods previously mentioned.

The machine is driven by a single 75-hp motor running at 600 r.p.m., direct connected through gears and reduced to 18 r.p.m. which produces 18 briquettes per minute. The briquettes are 4 in. in diameter, about 3 in. long, and weigh an average of 7 lb. each. This gives a production rate of 3.78 net tons per hour.

A few words should be said about the conveying systems since they represent about 36 per cent of the total cost of the installation. The cast-iron borings are dumped through gratings in the floor of the machine shop into a 40-ton storage hopper from which they are fed into a bucket elevator and hoisted 35 ft. to a point where they are discharged onto a belt conveyor. This conveyor, as well as six others, are 4-ply, 28-oz. rubber-covered belting, 14 in. wide, running in 3-roll troughing idlers with 5-ft. centers at a speed of 130 ft. per minute. There is over 1,000 ft. of this belting carrying the borings from the machine shop to the cupola charging deck where they are screened and delivered into the 150-ton storage bin directly over the feeder hopper on the briquetting machine. The screening is accomplished by a ball-bearing, counter-flow, single-deck screen with $\frac{1}{4}$x$1\frac{1}{4}$-in. rectangular mesh. As the briquettes are pushed

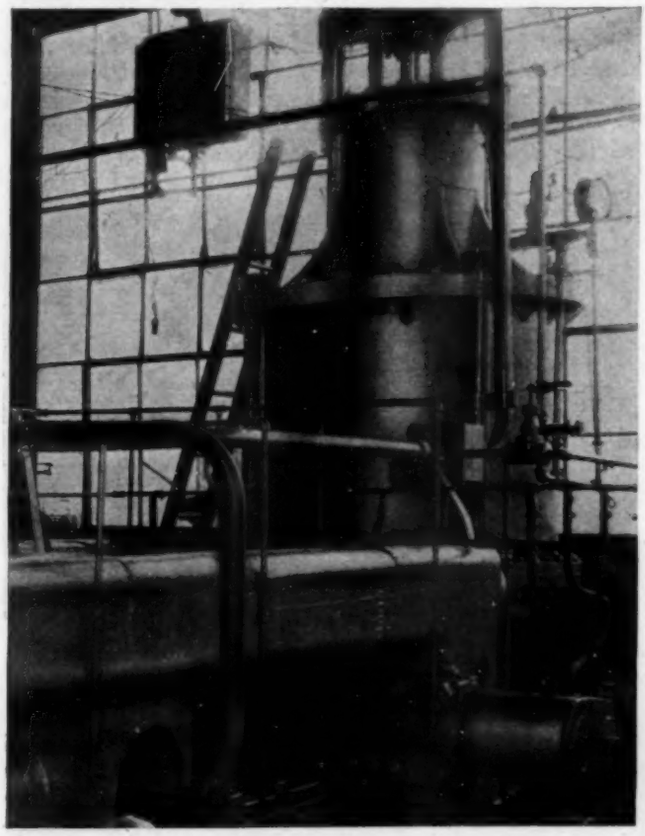


**Fig. 4—Hydro-Pneumatic Balancer used to maintain a steady pressure on the dies at the extreme forward position of the crank**

**Fig. 5—Before being delivered to the briquetting machine, all borings are screened in this rectangular mesh vibrating screen**

out of the mold they fall onto another short conveyor which carries them into a storage yard underneath the traveling crane. They are then picked up as required by a magnet crane and placed on the deck ready to be made into charges.

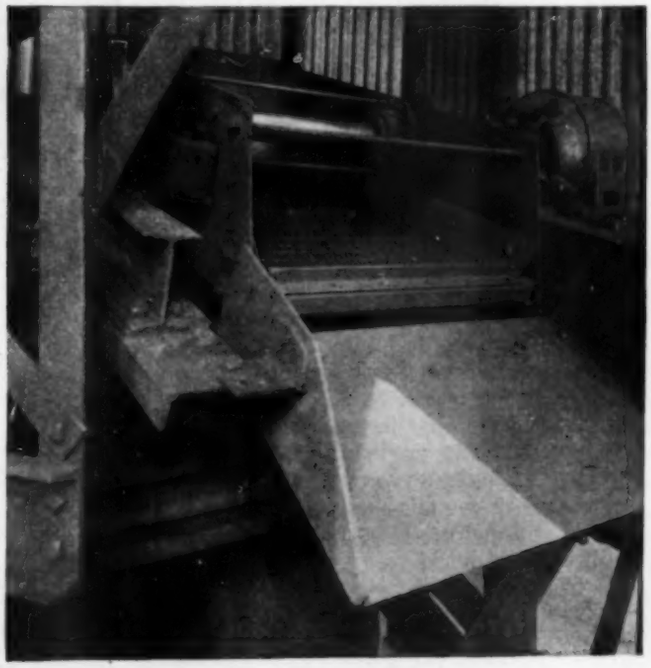
The Wilson company machine was installed by the middle of March, 1929, and started operating with the usual amount of troubles incidental to new equipment of this magnitude. Slight changes in the conveying equipment, in the screening arrangement and machine adjustments had to be made. However, during the last half of March and the month of April, we manufactured 202,287 briquettes, or 708 net tons. On May 1, we started keeping a record of the life of the molds or dies. This record is given in the accompanying table. It shows large variations, due to the hardness and material of the dies and also to the adjustments of the plungers and crossheads. We found that the best success was obtained from dies made of oil-hardening, non-shrink steel as is evidenced by the records of dies numbered 9 to 14 inclusive.

MOLD OR SLEEVE DIE RECORD IN 1929

| No.: | Date Installed | Date Removed | Briquettes Made |
|---|---|---|---|
| 1 | May 1 | May 9 | 145,717 |
| 2 | May 9 | May 10 | 23,179 |
| 3 | May 11 | May 21 | 131,730 |
| 4 | May 22 | May 28 | 91,781 |
| 5 | May 29 | June 4 | 40,320 |
| 6 | June 5 | June 7 | 63,480 |
| 7 | June 8 | June 11 | 41,688 |
| 8 | June 11 | June 15 | 75,498 |
| 9 | June 15 | June 24 | 101,103 |
| 10 | June 25 | July 8 | 114,918 |
| 11 | July 8 | July 23 | 165,735 |
| 12 | July 24 | Aug. 14 | 143,563 |
| 13 | Aug. 14 | Sept. 5 | 152,305 |
| 14 | Sept. 5 | Oct. 3 | 146,439 |
| 15 | Oct. 3 | Nov. 25 | 96,797 |
| 16 | Nov. 25 | Dec. 9 shut down | 52,897 |
| | | | 1,587,150 |

AT the start of the operations we had five men, two on the machine and briquette conveyor, and one on the boring conveyor during the day and two men nights, which we finally reduced to one man days and one man nights. This reduction was accomplished by speeding up the borings conveyor together with other slight changes, so that it was possible to convey from the machine shop enough borings in four hours to run the briquetting machine 20 hours with a production of 75.6 tons of briquettes.

In the following table is given the cost of production



per net ton of briquettes produced for the eight months, approximately, that the machine was in operation during 1929:

COST OF PRODUCTION

| | |
|---|---|
| Labor | $3,895.00 |
| Maintenance | 3,221.08 |
| Depreciation | 4,842.34 |
| Total cost of production | $11,958.42 |
| Net tons produced | 6,263 |
| Cost per net ton | $1.91 |

We have every reason to believe that this figure will be reduced in 1930 considerably because of the smaller amount of labor required, as previously mentioned, and because of a marked reduction in the maintenance cost through the use of more suitable materials.

The percentages of the various materials used in a cupola charge are given for the first three months of 1929 in the first column below, and the percentages used during the last eight months in the second column. The month of April is intentionally left out of the averages because we were feeling our way along in the use of briquettes during this period.

PERCENTAGES OF MATERIALS USED

| | Before | After |
|---|---|---|
| No. 2 malleable | 34.80 | 28.40 |
| No. 8 silvery | 10.65 | 10.81 |
| Southern (high phos.) | 2.86 | 2.95 |
| Spiegel | 0.13 | 0.27 |
| Steel rails | 18.06 | 14.26 |
| Cast scrap | 32.12 | 25.36 |
| Rim steel | 1.19 | 0.09 |
| Ferro-silicon | 0.08 | 0.11 |
| Briquettes | None | 16.67 |

It is evident that the amount of purchased material was reduced by 16.67 per cent of the total melt, and when we figure that the prevailing market price of cast-iron borings varies from $10 to $14 under the market price of pig iron or steel rails in our district, it is easily seen that a large saving in the cost of direct materials was brought about. In our foundry this saving amounted to $2.16 per net ton of iron charged into the cupola. During the last eight months of 1929 we melted 28,378.28 net tons, which, multiplied by the $2.16 saving, gave us a saving of $61,296.78. Comparing this figure with the cost of the installation, it will be noted that the machine nearly paid for itself in the eight months of operation.

THE briquettes are loaded into the charging bucket by hand forking, and are placed on the top of the charge to eliminate possible breakage when the charge is dumped into the cupola. The coke for the following charge forms a cushion protecting them from the succeeding layer of briquettes. In order to take care of breakage and loose borings, which we have found to amount to a little less than 5 per cent of the borings briquetted, a grating was placed over a spout leading to the ground floor where they are caught in a dump trailer and returned to the storage hopper for re-briquetting.

By actual tests on heats made up of all briquettes, and by a check on our loss in the cupola through weighing the molten metal as it comes out, we have arrived at a melting loss of slightly under 10 per cent on the briquetted borings in the cupola. This loss is taken care of by adding 10 per cent to the actual briquetting cost, and was considered when figuring the savings made.

We did not find it necessary, even when using as high as 21 per cent briquettes in the mixture, to use additional flux nor any additional coke in the charge. There is no change in the melting rate of the cupola nor in the temperature of the iron at the spout or in the foundry. We did find, however, that our oxidation losses of 7 per cent of the total silicon charged into the cupola, increased to 10 per cent. It might be well to remark at this point that the blast pressure in the wind box runs from 22 to 24 oz. and that a melting rate of 25-26 net tons per hour is maintained in a cupola lined to 72 in. inside.

Another point of interest is the briquettes melt much as does any other cast scrap in the cupola. They do not disintegrate in the melting zone as is evidenced by the bottom drop on the end of the heat. There is, however, a slight display of iron sparks at the charging door during charging operations, more pronounced during the blowing-down operation at the finish of the heat.

A test heat using all briquetted borings was recently run in our experimental cupola which is lined to 24 in. This heat consisted of four charges of 600 lb. each, using 90 lb. of coke between charges, 30 lb. of limestone, and 4 lb. of fluorspar. The iron came out very hot and a recovery of 2,208 lb. was obtained, which gives a melting loss of 8 per cent in the cupola.

**Fig. 6—Series of belt conveyors used to discharge cast-iron briquettes from the machine to the yard where they are picked up by a magnet crane**

The average analysis of the briquettes as charged, and the average analysis of the metal obtained are shown below. There was a loss of 26 per cent in the silicon and 21 per cent in the manganese. The physical properties were very good as was also the structure.

ANALYSIS OF TEST HEAT

| | Borings in Per Cent | Iron Out Per Cent |
|---|---|---|
| Silicon | 2.30 | 1.63 |
| Sulphur | 0.08 | 0.148 |
| Phosphorus | 0.195 | 0.195 |
| Manganese | 0.75 | 0.58 |
| Total Carbon | 3.35 | 3.17 |
| Brinell on 1-in. square bar | 260 | |
| Tensile strength | 35,660 | |

Two factors must be considered when discussing the effect of briquettes on the metal: first, the quality of the metal and, second, the quality of the resulting castings. For comparative purposes the months of March and June, 1929, were chosen. No briquettes were used in March, while 16.1 per cent were used in June. The table gives the average chemical and physical properties of the bars tested for these two months.

CHEMICAL AND PHYSICAL PROPERTIES

| | March | June |
|---|---|---|
| Number of days worked | 21 | 20 |
| Average net tons per day | 344.74 | 377.03 |
| Number of bars analyzed | 357 | 365 |
| Silicon | 2.31 | 2.35 |
| Sulphur | 0.075 | 0.076 |
| Phosphorous | 0.189 | 0.199 |
| Manganese | 0.76 | 0.73 |
| Total carbon | 3.40 | 3.34 |
| Brinell hardness | 206 | 207 |
| Trans. strength, lb. (1 in. sq. × 12 in. centers) | 2713.1 | 2812.5 |
| Deflection, in. (1 in. sq. × 12 in. centers) | 0.130 | 0.136 |
| Number of tensile bars tested | 84 | 80 |
| Tensile strength, lb. per sq.in. (0.305 in bar as cast) | 33,850 | 33,385 |

It is interesting to note that there is practically no difference in the average chemical and physical properties of the metal during these two months.

Unquestionably, the percentage of good castings produced is the controlling factor paramount in the minds of most plant managers. Figures issued by our cost department indicate that there was practically no difference in the percentages of good castings and scrap produced in the month of June when using 16.1 per cent briquettes in the mixture as compared to the month of March when no briquettes were used. Another important factor is the machinability of the castings: our machine shop could notice no difference in the machinability of castings with or without borings in the mixture.

In conclusion, I believe it is sufficient to say that the question of whether or not briquetted cast-iron borings can be used successfully in the cupola resolves itself into a problem of economics. Our experience and that of others using similar equipment proves that there is no detrimental effect on the quality of the metal itself nor on the percentage of good castings produced, when using up to 20 per cent borings in the mixture.

■

## Fifty Years of Machinists' Tools
### *Discussion*

JOSEPH HEWES

IN AN article under the title given above, on page 11, Vol. 73, of the *American Machinist*, Fred H. Colvin gives an interesting account of the manufacture of small tools fifty years ago.

Reading the article reminded me that as early as 1875 I was the proud possessor of a ½-in. Brown & Sharpe micrometer caliper. But it was not called by that name. I do not think the term "micrometer" was applied to such tools at that time. The tool referred to was cataloged as a "Pocket Sheet Metal Gage."

As Mr. Colvin states, there were no gage blocks fifty years ago. But there were accurate standard gages. In 1877, two others and myself were engaged in the business of making standard gages, both of the plug and ring; and the snap or caliper types. We made gages of two classes of accuracy, the higher class being guaranteed to be accurate within 0.00004 inch.

However, there was not enough demand for our product at that time to render the business profitable. After worrying along for about a year, we received a good offer for the business, which we promptly accepted. The same business, with some additional articles of product, is now being carried on by the John M. Rogers Company, Gloucester, New Jersey.

## Fulfilling Replacement Promises
### *Discussion*

LUTHER D. BURLINGAME
*Brown & Sharpe Manufacturing Company*

AT THE spring meeting of the National Machine Tool Builders' Association, Ernest F. Du Brul made a statement, during a discussion of methods to bridge over and shorten the period of depression, to the effect that "about the only thing we can do is to keep calling this situation to the attention of our customers, urging them to do their replacing of old equipment in dull times rather than in times of boom." This rings true and leads to the wish that such a plan might be carried out in fact as well as in theory by the many who hesitate to adopt such a policy in times which they feel call for retrenchment instead of replacement.

In a recent number of *American Machinist* (Vol. 72, page 789), the editor, K. H. Condit, under the title, "Fulfilling Replacement Promises," gives prominence to an interview with vice-president De Wolf of the Brown & Sharpe Manufacturing Company. In this interview, it was pointed out that the policy of replacement had not been discontinued at these works because of a slackening of business. This interview illustrated the carrying out of a policy such as is advocated by Mr. Du Brul.

With these discussions fresh in mind, when having occasion a few days since to investigate some historical records of the business, I was impressed with the truth of the saying, "History repeats itself," when I ran across the following item in an old letter copy book.

During the panic of that year, Lucian Sharpe wrote to a prospective customer that the Brown & Sharpe shop was working with a much reduced force and shortened hours, and then goes on to say:

"We have been enlarging the shop and have now the whole second story. The lathes and the tools have been moved upstairs. All the tools have been put in complete order, painted, and varnished, and everything arranged in anticipation of the good times coming."

While this may not show that there was actually an increase of equipment at the time, the spirit of a progressive policy is evident, and shows that far-sighted leaders in the early days not only advocated but put into practice a policy of preparing in dull times for better times to come.

■

BRITTLENESS, peeling, or non-adhesion of chromium to brass or iron in plating is often a result of incorrect preliminary deposition of nickel, and not in the subsequent deposition of the chromium, according to W. Phanhauser in a recent issue of *Chemiker Zeitung*, German chemical engineering publication. Evolution of hydrogen during deposition of chromium and its absorption in the metal cannot be avoided. As the hydrogen readily diffuses from the chromium into the nickel, the capacity of the latter may be exceeded easily. This results in the faults mentioned. The author recommends the use of baths which give a sufficiently strong and ductile product, low in hydrogen, which is adaptable for subsequent chromium plating, even with the use of high current densities, to deposit a nickel coating as low in hydrogen as possible. Blisters in the chromium plating may be caused also by improper or insufficient removal of grease from brass before plating.

# Constant Chord Gaging

## *Discussion*

**A summary of comments received on W. A. J. Chapman's article published in *American Machinist*, Vol. 72, page 753.**

### Allan H. Candee

ALTHOUGH of mathematical interest and of obvious simplicity, there are certain practical objections to "constant chord" measurement. For instance, with at least three different methods of gearcutting in use—hobbing, shaping, and milling—frequently in the same shop, it is unquestionably safer to measure tooth thickness at or near the pitch circle. By so doing, we avoid the chance of error caused by difference in pressure angles and profile curves.

When greater accuracy is desired than can be obtained with vernier calipers, measurement with a micrometer across two pins, placed between gear teeth diametrically opposite each other, has been found by actual experience to be much more sensitive and reliable. The tables previously published in *American Machinist* make the determination of the correct dimensions for standard gears very simple.

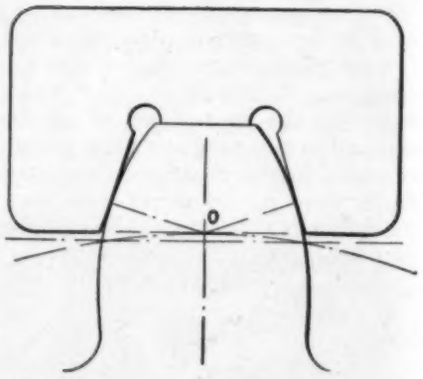
The method of measuring tooth thickness as described in the article by W. A. J. Chapman in *American Machinist* is not new. Measuring involute spur gear teeth across the points of contact with a rack was completely described in "Gears and Gearing" by Bramley-Moore published in London in 1921. The Sykes Gear-tooth comparator is designed on practically the same principle.

### Chester B. Hamilton, Jr.

*President, Hamilton Gear and Machine Co., Ltd.*

WE READ with interest the article in *American Machinist* by Mr. W. A. J. Chapman of England. Professor Buckingham's note at the top is also interesting. The writer has gone a step further than this, and we now use solid gages measuring by the tangency of flat surfaces at the same contact points recommended by Mr. Chapman. That is to say, the gage simulates a tooth space of the basic rack below the pitch line of said rack. Lack of durability is one of the very serious weak points of the tooth vernier, and the form of gage indicated by Mr. Chapman which measures to points.

We imagine from the phraseology of Professor Buckingham's note that he has not read Bramley-Moore's book entitled "Gears and Gearing" published in 1921. The chapter headed "Measurement of Gear Teeth" shows the Brown & Sharpe tooth vernier (with sharp corners of course) used to measure the tooth thickness at the points indicated by Mr. Chapman.



**The constant chord method of gaging permits the use of solid templets each of which will measure gears having a common pitch and pressure angle**

### Frederick Franz

*Engineer*

W. A. J. CHAPMAN finishes his article on the above subject by writing, "Since pitch and pressure angle are uniform in a set or train of gears, whereas the tooth number usually differs, the measurements are greatly simplified by the possibility of using constant dimensions for chordal length and depth."

For any diametrical pitch, his constant chordal length $w$ and constant depth $d$ may be computed by his formulas:

$$w = \frac{\Pi}{2S}\ cos^2\psi$$

$$d = \frac{1}{S}\left(1 - \frac{\Pi}{8} sin\ 2\psi\right)$$

in which, $S$ = the diametrical pitch, and $\psi$ = the angle of pressure.

Is it possible to measure an involute gear tooth at these points unwittingly by setting our gear tooth vernier to the commonly known tooth thickness at the pitch line, $w'$, and the commonly used depth, $d'$, equal to the addendum, as determined by the following simple axiomatic formulas?

$$w' = \frac{1}{2} \text{ of } \frac{\Pi}{\text{diametral pitch}} = \frac{1}{2} \text{ of circular pitch}$$

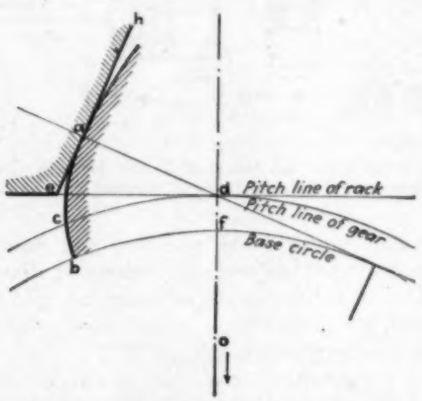
$$d' = \frac{1}{\text{diametral pitch}} = \frac{\text{circular pitch}}{\Pi}$$

The answer is yes. It can be done by a gear tooth vernier having jaws that are beveled to correspond with the pressure angle. Such a vernier would have an appearance like that illustrated. Each jaw tip is beveled to 14½ deg. (or 20 deg. if that system of gearing is used). The tooth width slide would read zero when points *e* and *e'* are coincident. The tooth depth slide would read zero when the depth jaw is on a level with the points, *e*, *e'*.

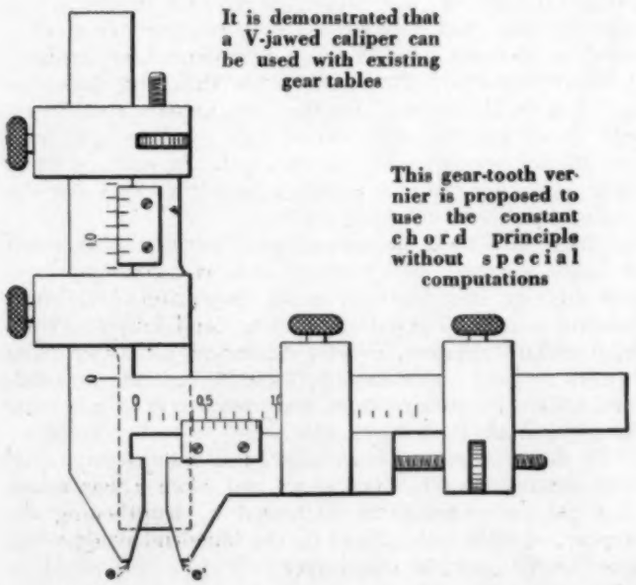
This is the explanation. The involute, *acb*, is described from the base circle, *bf*. It represents one face of a tooth, which is in contact with a rack, *eah*, the center line of which is *do*. The involute cuts the gear pitch circle at *c*. Distance, *ed*, is half the rack space width. If we can prove that *cd* is equal to *ed*, we must conclude that calipers having jaws beveled along *eah*, and making contact at *a*, measure the actual thickness, *cd*, of the gear tooth along its pitch line. That *cd* is equal to *ed* follows from the principle of construction, namely that the pitch lines roll without sliding, making *cd* equal to *ed*.

Such a caliper, if it were available, would have greater resistance to wear at the measuring points, because flat surfaces instead of sharp corners make contact with the tooth being measured. The values *w'* and *d'* are already widely published and may be taken from almost any gear book or gear catalog, or they may be easily and quickly computed.

If Chapman were to set his calipers to check a gear, he would be forced to calculate his *w* and *d*, or to publish and circulate new tables giving these values. Although I set my calipers for the actual thickness at the pitch line and the actual addendum, my calipers nevertheless make contact at exactly the same points as Chapman's. The contacts, however, are flat surfaces instead of sharp corners.




**It is demonstrated that a V-jawed caliper can be used with existing gear tables**



**This gear-tooth vernier is proposed to use the constant chord principle without special computations**


**W. E. Sykes**
*Consulting Engineer*
*Farrell-Birmingham Company*


THE writer has read the article appearing in *American Machinist*, Vol. 72, page 753, which has a foreword by Earle Buckingham. The method described in this article has been described before. The Sykes gear-tooth vernier caliper as well as the Sykes comparator use this chordal method. The Sykes vernier caliper was patented in England in 1919, and it was put on the market during that year. It was described in several of the English technical journals. I abandoned the manufacture of this vernier caliper some years ago and have concentrated on the comparator which has proved to be a reliable and useful instrument eliminating the necessity of having to use two scales—one at right angles to the other. In addition, the chordal method of using the Brown and Sharpe vernier caliper has been described.


**Nikola Trbojevich**
*Research Engineer, The Timken-Detroit Company*


THE constant chord method has been publicly known for some time. I refer to the book, "Spur, Spiral, and Bevel Gearing," David Brown & Sons, England, in which the constant chord settings are given both in the form of formulas and tables. The tables are particularly attractive in that they give in addition to the settings for standard 14½ deg. and 20 deg. pressure angle gears, settings for twenty different combinations of long addendum gears. I also refer to the book "Gears and Gearing" by Bramley-Moore published in 1921 in which the method of constant chords is also very clearly given.

As to the advantages of the constant chord method, they are at best only slight, in my opinion. The main drawbacks are, first, that in measuring the tooth thickness, the readings are influenced by the possible errors in the pressure angle, and second, by measuring at a considerable distance above the pitch line, the exact amount of backlash actually existing is hard to judge.

For a one diametral pitch, twenty-degree pressure angle gear, the height above the pitch line where the measurement is now taken is equal to:

$$\frac{\Pi}{8} \sin 40^\circ = 0.252,$$

that is over one quarter inch above the accustomed place, and the thickness there is equal to:

$$w = \frac{\Pi}{2} \cos^2 20^\circ = 1.387$$

that is 0.184 in. less than standard thickness, which is 1.571 in.

Suppose now that the gear has nominally a twenty-degree pressure angle but actually only a 19½ deg. pressure angle. Things like that happen, you know. Then,

$$w = \frac{\Pi}{2} \cos^2 19^\circ\ 30' = 1.396,$$

an error of 0.009 in. which error partly defeats the purpose of measurement.

As to the backlash, the problem is not simple. By

going with the tooth caliper 0.252 in. above the pitch line we reduced the thickness of tooth from 1.571 in. to 1.387 in., that is, by twelve per cent, so we might think that by reducing the predetermined backlash also by twelve per cent we should get a correct reading, but we don't. The explanation of this lies in the fact that when measuring on a pitch line in the old-fashioned manner, all co-operating gears have the same pressure angle at the point of measurement; however when measuring at 0.252 in. above the pitch line, each gear will show a different pressure angle depending upon the number of teeth in the gear. Thus, for instance, in a twelve-tooth pinion the pressure angle will increase from 20 deg. to 26 deg. 20 min., whereas in a rack, there will be no increase at that distance. To be exact, the allowance for backlash ought to be calculated separately for each number of teeth in order to equal the accuracy of the method now used.

It was my experience in measuring, that the best way to measure anything is to take one variable at a time. In that case the errors if any, may be allocated where they belong. Accordingly, when I desire to measure the thickness of a tooth, I want to measure it at the point at which the errors in the pressure angle will not affect the accuracy of the reading, that is, at the pitch line.

**Earle Buckingham**
*Professor of Mechanical Engineering*
*Massachusetts Institute of Technology*

I HAVE never seen the Bramley-Moore work on this subject, but it appears that the method has been disclosed there. In reference to Mr. Trbojevich's comments, the major value of any tooth-thickness measurement is to control uniformity of cutting. For this, one point of the profile is as good as another. In production, tooth profile should be controlled by the original testing of tools, machines, and their settings.

The gear tooth micrometer and the templet gage from Chester Hamilton measure from these same points as also Sykes Gear-tooth comparator. All of these instruments have proven extremely satisfactory in use, which refutes the arguments that the point of the profile where the constant chord exists is an improper one from which to measure.

■

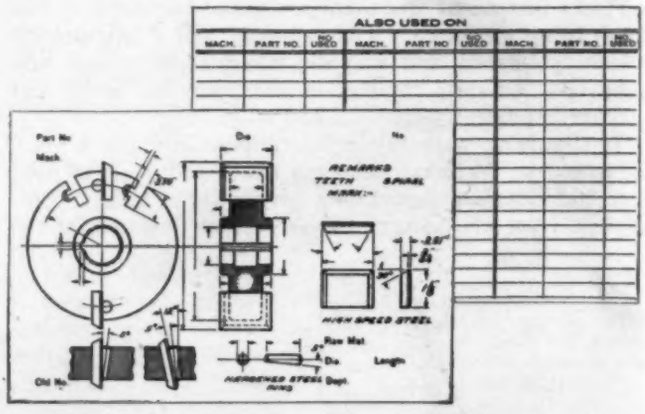
BY VARIOUS combinations of cold-work and heat treatment, spring materials can be produced which have tensile strengths as high as 400,000 lb. per sq.in. and will withstand fiber stresses as high as 300,000 lb. per sq.in. Such materials are known as clock spring wire, which is annealed and cold rolled many times to the correct size, then hardened and tempered; music wire, which is patented and cold-drawn to size; tempered wire, which is annealed, cold-drawn to size and then oil-tempered. Proper heat treatment of spring steel gives ductility and certain forming qualities desirable in cold-rolled sheet spring steel for special flat springs which are to be bent, formed, or deep-drawn. It is now considered entirely possible, by thoroughly spheroidizing spring steels and by careful regulation of the size and distribution of the carbide, to produce steels up to 80 deg. carbon with excellent drawing qualities, and steels up to 1 per cent carbon which will fold on themselves either way of the grain.

# Speeding Tool Design with Typical Outlines—*Discussion*

J. A. Potter
*Chief Draftsman, Singer Manufacturing Company, Bridgeport Factory*

COL. JOHN O. JOHNSON'S system, with its application to gages, under the above heading on page 980 of Vol. 72, *American Machinist*, has been proven to be an excellent one. The same system, applied to small tools, was used by the War Department, Bureau of Aircraft Division, New York, during the World War, although the details were not as complete as in the illustrations furnished by Col. Johnson.

Outlines were made on 4x6-in. cards to fit a card file, and space was provided on the back to show assignment of the finished tools and the machines on which they were used. Also printed on the card were: Part numbers, machine, number, old number, and raw material specifications. Such needed dimensions as diameter, radius, number of teeth mark, and diameter and length of raw material and department from which secured were also included where necessary.




**Outline Card for an Inserted Tooth Milling Cutter. Supplementary information is carried on the back**

Some of these cards also had provision for slight changes which did not affect the general design. For example, one card showing the stop counterbore gives a selection of shanks, either taper, commercial, or straight. Another, for a form tool, allows for different shapes or forms to be drawn in. Further, the quarter-round cutters which can be made either right or left have both possibilities provided for on the card. In each of these three examples the tool designer simply crosses out the outlines which he does not require.

Other small tools are also adapted to this system, such as hand reamers, shell reamers, concave, convex, plain, and angular stem cutters, solid, expansion, and knife machine reamers, grinding, milling, and cutter arbors, stepped line reamers, collets, extension collets, slotting cutters in gang, pilot inserts, straddle cutters, stop collars, collars for arbors, taps, and many tools of a similar nature that are used in quantity.

To the best of my knowledge, the system originated with steam engine builders years ago when it was found that the power could be increased by lengthening the stroke. A little soda placed on the blueprint made white spots which could be inked over.

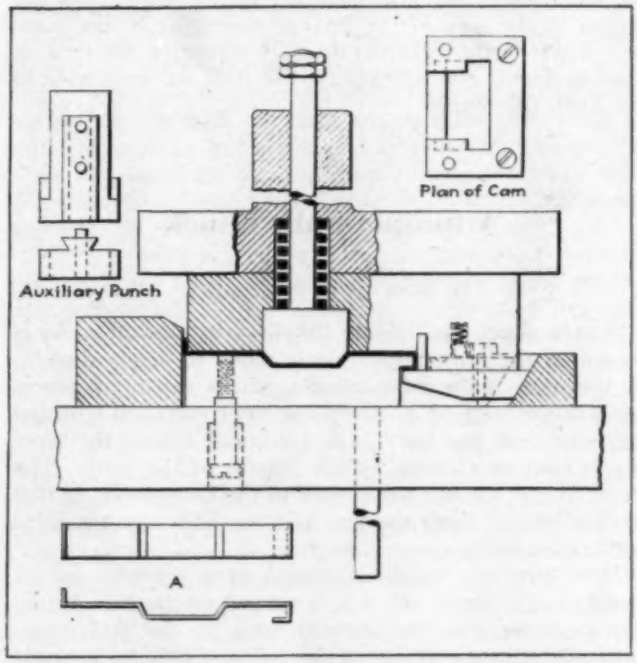
# IDEAS FROM PRACTICAL MEN

## Three-Direction Bending Tools

D. A. BAKER

A PART such as the one shown at *A* is usually bent in two operations, but the tools illustrated were designed to complete all the bends in one operation. One of the features of the tools is an auxiliary punch carried by the main bending punch, in which it slides on a dovetail and is operated by a stationary cam mounted on the die-block. The operation of the auxiliary punch occurs near the end of the downward movement of the ram.

In operation, the blank is nested on top of the die, though the nest is not shown in the illustration. On the downward stroke of the ram the upper spring pad strikes the blank, the heavy spring offering sufficient resistance to allow the pad to make the bend in the center. While the center bend is being made, the main bending punch turns down the right-hand end of the blank. The lower spring pad remains in its upper position while these



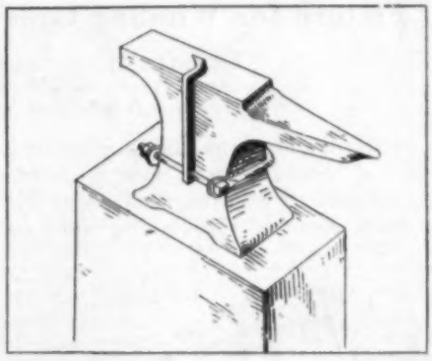

bends are being made, and at their completion the inward bend at the right is being started by the auxiliary punch, which previous to this time has been in its extreme right-hand position. Continued downward motion of the ram carries down the lower spring pad, permitting the main bending punch to make the upward bend at the left. At the same time, ears on the sides of the auxiliary punch engage in corresponding slots in the stationary cam, forcing the punch toward the center and completing the bend at the right.

Upon the upward movement of the ram, the auxiliary punch is moved to the right, releasing it from the work, while the work remains under pressure between the upper and lower spring pads until the ram nears the upper end of its stroke. When the ram is at the top of its stroke, the auxiliary punch is disengaged from the cam. In this position, a ball in the main bending punch, backed by a spring, engages a dimple in the auxiliary punch and acts as a detent to prevent it from being accidentally moved. Thus when the ram descends, the ears on the punch will engage the slots in the cam without interference.

## A Convenient Hardy

A. F. JOHNSTONE

An anvil equipped with a pivoted hardy, as shown in the illustration, is very convenient where parts of work are to be cut off at various intervals during the forging, such as in trimming coal augurs during the process of sharpening. The hardy is pivoted on a U-shaped rod hung on a bolt that passes through a lengthwise hole in the anvil. When in use, its L-shape brings the cutting part to the center of the anvil face. When it is not needed, a push will tilt it backward, letting its free end rest on the anvil block. When it is wanted, the smith can reach over and hook it with the head of his hammer, drawing it into place. Thus he is saved the time necessary to pick up a hardy and insert it in its hole each time he wants to use it, and to take it out of its hole and lay it down when he is through using it, to say nothing of having to hunt it should it get mixed with his other tools on the anvil block. When the hardy is not in use, the anvil face is clear from end to end.



## Bending Fixture For a Small Part
### *Discussion*

T. SMITH
*Nottingham, England*

The die shown on page 466, Vol. 72, of *American Machinist*, by C. H. Willey, is to my mind a very costly tool for doing the simple job shown. Why a hand bending tool should be made, in the style of the old Oliver hammer, with its swinging arm, costing several times as much as a simple push-through, and this on the plea of cheapness, is more than I can understand.

We do hundreds of jobs like this in a year, when making models, partly by hand and partly by improvised

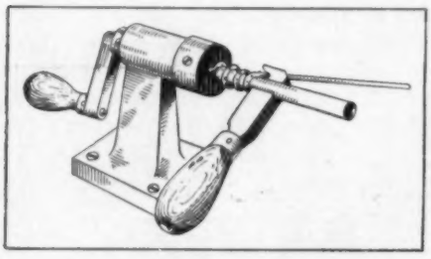
tools. Our methods are as follows: We keep in stock several widths of good mild steel plate ¼ in. thick. We saw off a suitable length, mark the bending outline on the top, drill out as much metal as possible, then file to the line. This takes but little time, for the job shown a half hour will see the plate ready. For the top tool, we keep holders to which we fasten a steel piece to fit the opening made in the plate. The hacksaw and file do the trick in very little time, again about a half hour for the piece shown. We keep a small foot press in the model department on which we mount the ¼-in. plate on parallels, fix the top in the ram, and adjust this until it just clears the top of the plate allowing for the insertion of the blank on the bottom plate. If we have many to bend, we use pin gages fitting the blank. We have now a simple push-through die, which will bend thousands of pieces as well as the best made die. With a push-through die, the upwards stroke of the foot press can be checked so that the girl can insert the blank but not her fingers. The downward stroke is adjustable to allow the bent blank to be stripped under the plate on the return stroke. The cost of a die like this is less than twenty-five dollars for the job shown.

■

## Fixture for Winding Coils or Springs

CHARLES H. WILLEY
*Assistant Plant Superintendent,*
*Hoyt Electrical Company*

A fixture that was built for winding special resistance coils of No. 12 Cupron wire, is shown in the illustration. It consists of a small head bored to receive a spindle; a crank-operated spindle, the outer end of which carries a small chuck; a mandrel on which the coil is wound; and a tool for guiding the wire.



The tool for guiding the wire has a semi-circular groove to fit the mandrel, and an annular slot through which the work passes. As the wire passes from the reel through the hole in the tool and around the mandrel, its tension keeps the tool in contact with the mandrel. The pitch of the coil is governed by the distance between the left-hand edge of the tool and the center of the hole through which the wire passes. A separate tool is, of course, required for each coil, or spring, having a different pitch.

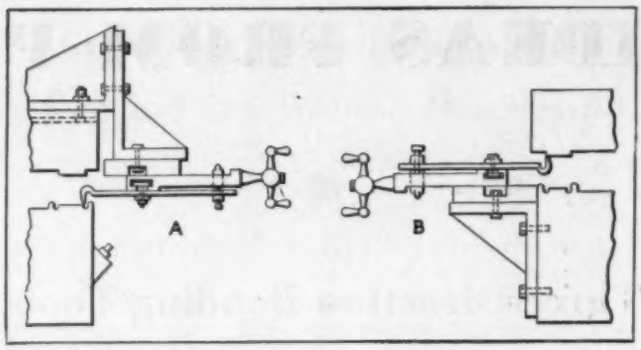
■

## Resurfacing the Table Bearings of a Boring Mill

H. W. PETERS

In overhauling a 10-ft. boring mill, we found that the table bearings, both on the bed and on the table itself, were badly scored. Since we had no boring mill large enough to handle the work of resurfacing, we did the job in the following manner:

The table was raised 4 in. by blocking under the end of the spindle, leaving part of the driving pinion in mesh with part of the internal gear in the table. By this means, the table could be revolved by power. As the spindle bearings were bushings having internal tapers and were adjustable endwise, we had no trouble in getting them to fit snugly on the spindle in its raised position.




For facing the bearing on the bed, we mounted the compound rest of an 18-in. lathe on an angle plate that was secured to another angle plate fastened to the table, as shown at *A*, the compound rest being upside down. With a hooked tool in the compound rest, and with the table revolving, we were able to take a smooth cut, feeding the tool at each revolution of the table. The tool was long and a C-clamp was used on its rear end to keep it from swinging under pressure of the cut.

For facing the bearing on the underside of the table, the compound rest was mounted on an angle plate attached to the side of the bed, as shown at *B*, the compound rest being rightside up. By repeating the process used in facing the bearing on the bed, we were able to get a smooth finish.

■

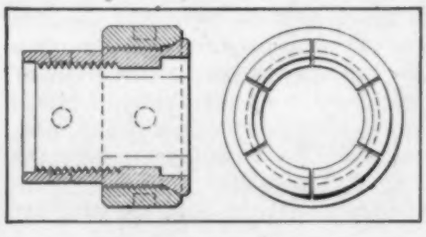
## A Simple Split Chuck

J. S. VEVANG
*M. & St. L. R. R. Company*

A split chuck for holding the disks of blowoff cocks is shown in the illustration. It is made to screw directly on the nose of the lathe spindle, and is slit in six places for a distance of 1⅝ in. from the outer end. Just behind the outer end, the body is tapered, and behind the taper is a nut fitting a thread on the outside of the body. The front of the nut is countersunk to the same taper as that on the body. Both the nut and the body are provided with holes for a spanner wrench.

With one of the disks placed in the recess in the front of the chuck, the nut is turned to the left, bringing its taper into contact with that on the body, thus closing the slitted section to the disk and holding it firmly enough for a truing cut to be taken across its face.

If it is necessary to use the chuck in a lathe having a spindle nose that will not fit the body, it can be mounted on an arbor fitting the tapered hole in the spindle, and threaded on its outer end to fit the threads in the body of the split chuck.



## A Problem in Shaper Work—*Discussion*

WILLIAM S. ROWELL

The set-up of the cast iron block on a shaper to machine a groove as described in Vol. 71, page 294 of *American Machinist* may be accomplished without the use of mathematics. First shape the outside surfaces

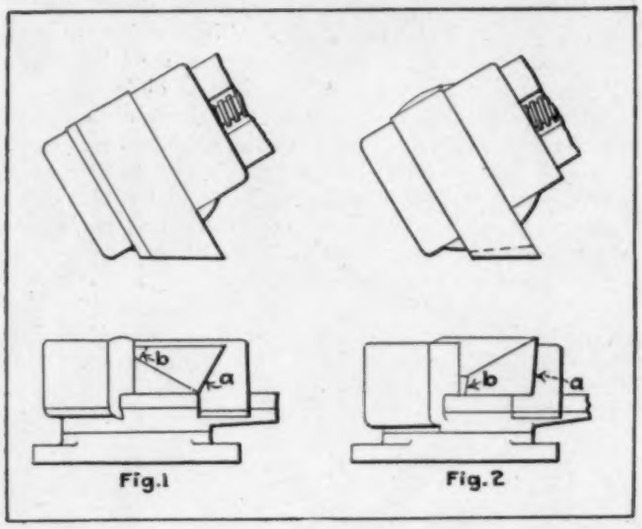



Fig. 1 Fig. 2

of the block. Before tilting it to cut the angular top and groove, swivel the vise 30 deg. and cut as much of the groove as the high end of the bottom will permit, leaving a light finishing cut on each side. Then tilt the work 30 deg. to cut the angular top.

This done use an indicator to reswivel the vise to bring the slot in line with the ram, and to show how much to shift the head to follow the slot already cut. When the work and head are set, so that the indicator reads zero when moved vertically and horizontally, both the bottom and sides of the groove can be correctly finished.

If the groove is shallow, fasten a temporary piece at the end of the block, and take a cut parallel to the groove before the block is tilted. The more extensive this surface, the better, as it will increase the accuracy of the setting.

Accepting the alternate interpretation of the original problem: namely, that the angular slot in the top face of block is 30 deg. to the end surface, measured in the plane of the angular top, use a sample piece to obtain the proper inclination of the toolhead to produce sides of slot 90 deg. to the bottom of the block. This sample should be a duplicate of the work in the matter of its bottom, sides, and angular top; but it may be much smaller. It should be a few inches deep, in order to obtain a more accurate setting of the toolhead when using indicator for that purpose. It should be long enough to supply a good hold in the shaper vise. With this block held as shown in Fig. 1, its angular top surface in a horizontal plane, and the vise swivel 30 deg., carefully machine the angular end while the toolhead is set at 90 deg. to the horizontal. Now reset the sample in the vise as shown in Fig. 2, its bottom in a horizontal plane, its sides vertical, the vise swiveled 30 deg. and shift the toolhead till an indicator attached to the tool reads zero while fed from the top to the bottom of the angular end surface.

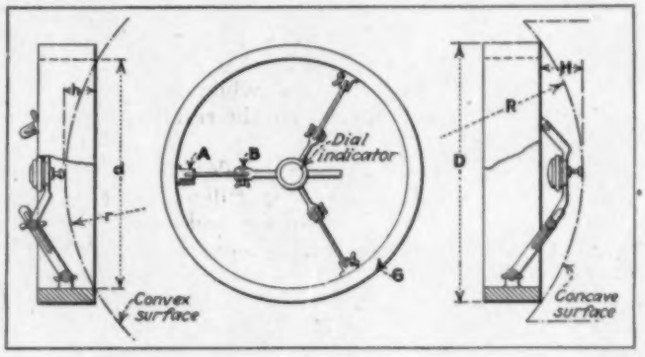
The work, all finished but the slot, may now be clamped in the vise and the slot machined with the setting of toolhead obtained with the indicator when used on the sample block; but the work must be reversed in the vise. That is, if the high side, *a*, of the sample was toward shaper, then the low side, *b*, of the work must be toward shaper; or the angular variant of the toolhead must be an equal amount on opposite side of 90 deg. This method carefully carried through will give as close an approach to a slot with sides 90 deg. to the base as most mathematicians will obtain in solving the problem, and no figures are required.

■

## Inspection of Spherical Surfaces

K. TAKAHASHI
*Tokyo, Japan*

The device illustrated serves as a convenient means of inspection for both convex and concave spherical surfaces. A dial indicator is supported by three adjustable arms within a rigid steel ring. From the radius of




the machined surface the height of the indicator above or below the bottom of the ring is computed according to the formulas:

$$h = r - \tfrac{1}{2}\sqrt{4r^2 - d^2} \text{ for convex surfaces}$$

$$H = R - \tfrac{1}{2}\sqrt{4R^2 - D^2} \text{ for concave surfaces}$$

*D* and *d* are constants dependent on the size of the ring. The indicator is set so that it reads zero when gage blocks to the height *h* or *H*, as the case may be, are used. The ring is then placed on the work, and the deviation of the indicator from zero will represent the amount of error on the spherical surface.

■

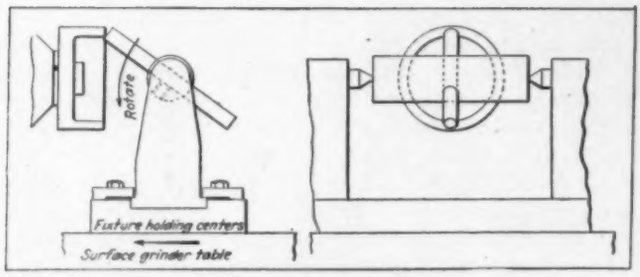
## Convexities and Concavities—*Discussion*

JOHN J. MCHENRY

Here is a method of grinding spherical ends which I have used successfully for making gage bars. A cup wheel is mounted on a Brown and Sharpe or similar surface grinder and trued on its face and inside diameter. A pair of centers is mounted on the grinder table.

Assume for example, the gage rod to be ground is ½ in. round and of a length between 5 and 10 in. Then if the length were 6 in., the ends would have the same contour as a 6-in. ball.

An arbor is made of about 1½-in. diameter having a ½-in. hole through the center and a setscrew at right angles to this hole. The gage bar is slipped through this ½-in. hole in the arbor and locked with the setscrew. The




arbor is then mounted between centers on the surface grinder table. Adjust the grinder table horizontally until the gage bar is located on the center line of the cup wheel. Adjust the wheel vertically to the center line of the arbor. This is done by rotating the arbor and adjusting the vertical movement until the wheel sparks evenly on top and bottom against one end of the gage bar.

Rotate the arbor by hand, grinding the gage bar ends by their contact with the edge of the inside diameter and face of the cup wheel. The feeding is done by the cup wheel handle in the direction of the arrow in the illustration. The bar will be ground with its ends perfectly spherical at any length—that is, the gage ends will always be the contour of the sphere at that diameter. I have used this method for years and while I cannot give a mathematical calculation to prove the result, I know it is a fact.

Editor's note: Does the method described invariably give a true spherical surface or is it dependent on a certain ratio between wheel diameter and length of bar? Since there is some difference of opinion on this point, further discussion is invited.

■

## Cutting Spiral Bevel Gears on a Miller

*Q. Is it possible to rig up a universal miller to cut a spiral-type bevel gear, also a herringbone bevel? I have cut skew bevels on a miller, but I do not think it practical to cut the other two types. Gearing is more or less a hobby with me, and I would welcome any advice on this subject.*

A. I do not know of any set-up on a universal milling machine which would produce a satisfactory spiral bevel gear. In the first place, the theoretical spiral should be a logarithmic spiral and not a uniform or Archimedes spiral. In the second place, the form of the tooth should change with the diameter of the gear. Thus, a milled gear of this type would have an incorect profile, and the side cutting of the formed milling cutter would vary because of its fixed angular setting and the changing helix angle of the gear with a uniform lead. The result would be far from satisfactory in almost every respect. A herringbone bevel gear would require a special machine to produce it. Here the results would be even worse than on a spiral bevel gear if a standard universal milling machine were used to produce it.

What is meant by practical? The cheapest method of producing a herringbone gear would be to pin two helical gears together. This would be satisfactory for relatively light loads, etc. For more severe conditions, too much of the torsional stiffness might be lost by using such a built-up construction. In this case, the solid blank should be used. Which of the two methods is most desirable depends almost entirely upon the operating and structural conditions.

# SEEN AND HEARD

●

### Experience or Imitation

EXPERIENCE frequently means far more than many seem to realize. Success in any undertaking or even in a single operation is rarely attained by watching others, unless one has a good background of experience behind it.

A case in point is the reaming of automobile cylinders in a plant that is trying to build motors on a small production basis. The boring of the cylinders was done very well, one at a time, with an indexing fixture on a heavy duty drilling machine. The final finish was secured by a modern honing machine. But the finish was not all that could be desired and the time required for honing was excessive.

The trouble was found to be in the reaming that followed the boring, this being more like a second boring than a reaming, as we know it. Instead of using a fast feed and a reamer that left a smooth surface, the reaming tool was so ground as to leave a distinct feed mark, and was fed at about the same rate as the boring tool. This left entirely too much metal to be removed by the hone, required too much time for the operation, and did not leave the finish desired. Lack of experience in good reaming practice was responsible for the lack of success in this case.

There are other places where experience counts in the finished product. Cylinder bores for example, that are round when they leave the grinding or honing operation, go out of round before they reach the assembly line, and piston fits are not all that might be desired. In one shop I know this was largely obviated by doing the grinding or honing after the studs and valve guides were put into place. Experience has shown that by forcing valve guides in place after grinding, or screwing in cylinder head studs after the cylinder block leaves the machining line, as was formerly common practice, is responsible for appreciable distortion, even though it be small in actual measurements. For where cylinder walls are frequently not over $\frac{3}{16}$ in. thick, and sometimes even less, it takes but little to distort them.

### Names of Things

NAMES of machines, especially names of machine parts and of tools, are far more important than is sometimes thought. Many machines are themselves so designated as to convey a fair idea of the work they do. But just why a buffing stand, which consists of a column that rests either on the floor or on a bench, and has a spindle carrying buffing wheels, should be called a lathe has never been quite clear.

Neither is buffing and polishing as clearly defined as it might be. Buffing would seem to apply to the grinding or smoothing of the surface by abrasive wheels and belts, and polishing to the securing of a polish or lustre as a final operation. In the minds of many their meanings are confused.

Then there is the "cherrying" machine that is really a special type of miller for making forging or forming dies. To complete the confusion the milling tool, a sort of ball cutter, is called a "cherry." Why not straighten out these definitions? —J.R.G.

# Crating and Packing

## Bracing, Sheathing, and Packing

Continued from Sheet No. 1a, "Nails and Corner Construction"

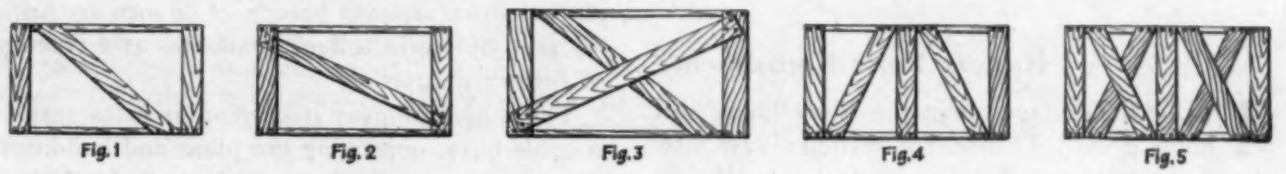



**Fig. 1—Diagonal brace applied to crate face by being nailed to narrow strip of frame members. Fig. 2—Brace nailed to wide face of end frame members and nails clinched. Fig. 3—Double or cross diagonals, combining the two preceding methods. Figs. 4 & 5—If crate is 1½ longer or more than it is high, long crate faces should be broken up into smaller panels by struts or intermediate strips, which should in turn be reinforced by either single or double diagonal braces. Cross diagonals are resawed from single diagonal**

SHEATHING should be added to the well-braced frame to protect goods from dust, dirt, water, oil, protruding points of other freight, and the lips of trucks. This sheathing does add somewhat to the strength of the frame, but the frame and diagonals are the foundation and the sheathing only a covering. Openings between sheathing pieces adjacent to finished surfaces should not be greater than 3 in., and sheathing should be used on the bottom faces of the crate to protect legs and other protrusions. Lumber considerably thinner than the frames is used, as indicated in Table IV.

Preparation of an article for shipping requires a certain amount of consideration of what it must go through during shipment, the distance, the probable number of handlings, possibility of storage, temperature changes, and similar factors. Detachable parts should be removed, packed well, and shipped in separate containers, or should be packed carefully and attached securely inside the article itself or inside the case. Small denim or burlap bags should be used to hold casters, bolts, or other small or loose parts. Drawers, doors, and slides should be closed and securely braced or blocked shut; locking is not sufficient nor safe. Attachments of various sorts should be fastened securely in place with tough twine, wire, or some other approved fastener.

The crate should be big enough to enclose entirely the article or articles, allowing no parts to protrude, except in the case of very large articles or machines where an exposed surface will not be damaged if it is struck. The article or articles must be blocked, braced, or fastened so that they cannot move inside the crate. Articles having legs which can be broken should be supported, suspended, or swung with approximately an inch of space between the bottom of the legs and the crate. Inside bracing and blocking pieces should be placed against the strongest parts of the articles. Topheavy articles should be braced at a point higher than their center of gravity. Machinery can be braced by means of diagonals bearing against the top of the machine and running to the base of the crate, but preferably to the skids. It is sometimes possible to fit a collar around the upright of the machine and to attach this collar to all sides of the crate to prevent motion in any direction.

Too much stress cannot be laid on inside packing. If a crate looks good yet damage is occurring, look to the inside packing of the article and you will probably find the cause of the trouble.

### Table IV—Thickness of Sheathing

| Length of Span (Feet) | Required Minimum Thickness (Inches) |
|---|---|
| 0 to 2 | ¼ |
| 2 to 3 | ⅜ |
| 3 to 4 | ½ |
| 4 to 5 | ⅝ |
| 5 to 6 | ¾ |
| 6 to 8 | 1 |

There are numerous ways by which an article can be fixed in a crate, so no attempt will be made to describe them. A few simple tests will guide in determining whether the method used is good or bad. These are as follows:

1. Shake the crate. Is the article free to move? Do the parts rattle? If so, the article is not packed securely.

2. If the article were removed, would the crate stand up alone? If not, the crate is not properly built.

3. Try to skew the crate out of shape. Does any part of the crate exert a dangerous pressure on the contents? If this happens, the crate is not rigid enough.

4. Is it possible to set the crate on its sides, front, back, or top without seriously endangering the contents? If this can be done, the crate is secure and the fastening of the article inside is satisfactory. (This does not mean that all articles should be so prepared that they can be trucked or loaded in any position, but rather to see what might happen should unusual conditions make such placing of the crate inevitable.)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American Machinist

*Editors:* KENNETH H. CONDIT AND FRED H. COLVIN

**New York, August 7, 1930**

VOL. 73 NO. 6

## *How is Your Equipment?*

THE OLD adage about the silver lining still holds good. France, for instance, cast into the deepest shadow by the clouds of the World War, was forced to start anew in setting up her industrial structure. As a result, she can boast today of the world's best-equipped factories. While other nations struggle with business depressions, with unemployment, with over-production, and with kindred economic ailments, France is busy. She alone has no unemployment.

How does your plant measure up to that of others in your industry? Is it as modern as your competitor's? The *American Machinist* Inventory of Metal-Working Equipment will help supply the answer.

With the next number will begin the publication of the 1930 compilation. While more ambitious in scope, the procedure essentially follows that inaugurated in the previous count of 1925. The former division of machines, over and under ten years of age, has been retained. This limit is recognized as arbitrary and does not comprehend factors of obsolescence or machine group characteristics, but it does afford a useful medium of comparison. It is hoped that the forthcoming series of articles will prove interesting and instructive, and that they will lead to action where action is needed.

## *Holding Your Organization*

ADVERSITY tests management as nothing else can do. Unless one is content to be an opportunist—hiring and firing with every change in demand, regardless of its effect on one's organization and on the community—a general recession of business is a time for careful study, for well thought out plans rather than hasty discharge and shut down.

The practices of two large companies in neighboring cities form a marked contrast in ways of meeting the present conditions. Both companies have suffered a material loss of business, yet they are handling the situation in entirely different ways.

One is chopping off the heads of experienced and trusted men, making a veritable reign of terror. This policy, rumor has it, is intended to reduce expenses and to make the rest of the employees work as never before. Old men are being replaced by recent college graduates at a fraction of former salaries.

The other company is keeping as many men as possible busy, improving the plant and building a conservative supply of standard products. Where necessary, good men are put on part time instead of being discharged. The management feels that the experience represented by men who have been with them from twenty to forty years is too valuable to be thrown aside.

Those who discharge men more or less indiscriminately after long service do not seem to realize that such action is a direct reflection on their own judgment. Either they are poor judges of men in the first place, or it takes them a long time to discover that a man is unfitted for the job, or both. If a salesman of experience cannot get business in a poor market it is folly to expect an inexperienced man to do half as well.

Broadly speaking, the concern whose management retains its experienced organization to the greatest extent can operate on closer margins and will come back more quickly with general business improvement.

## *It's All Relative*

PROOF of the misleading deductions that may come from comparisons is found in the statement of England's Master Cutler that, although Sheffield's famous plants are dull as compared with their war-time state, they are employing many thousands more men than before the war, and turning out half again as great a tonnage of work.

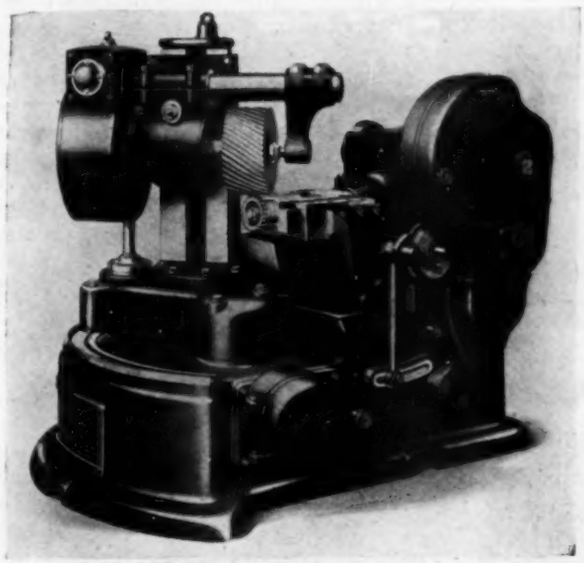
On this side we compare 1930 business with business of 1929 and some of us succumb to black pessimism. If we would only look back to 1928 or 1927 and do some more comparing we might be surprised out of our depression.

After all, such matters are all relative. We have not as yet a method of measuring them absolutely.

# SHOP EQUIPMENT NEWS

## "National-Cleveland" 18-Inch Universal Shaper

SHAPING of gear teeth in the horizontal plane is a feature of the universal gear shaper placed on the market by the National Tool Company, Cleveland, Ohio. This shaper employs the Simmons method, in which the work and the straight-tooth cutter rotate continuously, while the latter is being fed across the face of the work, meanwhile being moved intermittently in the transverse direction. On its return stroke the cutter is withdrawn from contact by a cam which actuates the cutter spindle slide. A small amount of metal is removed at each reciprocation, and since the two elements are constantly rotating, the wear on the cutter and the heat generated are fully distributed. Generating of the teeth is finished when the given pitch circles of both cutter and work are tangent.



"National-Cleveland" 18-Inch Universal Gear Shaper set up for cutting a wide-face helical gear

Both spur and helical gears can be cut by this method, it being necessary only to position the gear blank angularly with respect to the cutter axis. The gear blank may be adjusted quickly and accurately to the desired helix angle for right- or left-hand helical gears. This is accomplished by means of a turret carrying the work slide, which has a vernier scale reading in five minutes of a degree.

The double generating action makes possible the cutting away of metal between the teeth throughout the entire circumference of the gear, and in the case of spur gears throughout the entire face. Metal is removed from helical gears throughout the entire circumference, and gradually the cut moves across the face of the gear as tangency between the pitch cylinder of the gear and the pitch circle of the cutter is reached. Among the advantages resulting from the double-generating action are: the gear and cutter may be rotated at much higher speeds; the feed movement of the cutter across the face of the gear is intermittent and takes place just before the cutting stroke; in cutting helical gears of wide face the teeth are finished at one side and progressively advance across the entire face, and accuracy is obtained for exacting requirements.

By the use of a special workslide, helical gears, either right- or left-hand, of greater helical angles than 45 deg., and single or multiple-threaded worms of cylindrical form or hourglass form, may be cut. The workslide may be operated manually or by a special automatic feed mechanism. Such helical gears and worms can be generated by means of a straight-tooth cutter.

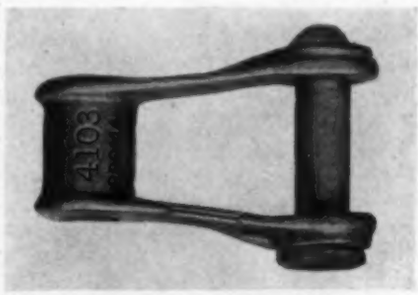
Although the 18-in. size is now the only unit available, 12-in., 36-in. and 72-in. models will be built. The last two will be manufactured on special order only.

Specifications of the 18-in. universal gear shaper are as follows: external gears—largest pitch diameter, 18 in.; maximum pitch for external spur and helical gears, 4 D.P. in steel; maximum width of face of spur gears, 9 in.; width of face of helical gear dependent upon the helical angle of the gear; right- or left-hand helical gears, up to 45 deg., helix angle; internal gears—maximum pitch diameter, 11½ in.; maximum pitch, 4 D.P. in steel; cutter, 4 in. pitch diameter, 1¼ in. hole; speeds of cutter, in five steps from 1 turn in 30 seconds to 1 turn in 8 minutes; cutter reciprocations, 70 to 1,120 strokes per min. in five steps; motor required, 3 hp.; floor space required, 5 ft. x 6 ft. 2½ in.; height of machine, 5 ft. 7 in., and net weight, 7,200 lb.

## Link-Belt "Promal" Chain

A line of cast chain showing greater strength and durability than malleable chain has been placed on the market by the Link-Belt Company, Indianapolis, Ind. This chain is sold under the trade name of "Promal." It is the result of extended research of the method of processing malleable iron, which so alters its physical characteristics as to make it a distinct metal. The chain is especially suitable for operating under heavy loads and abrasive conditions.

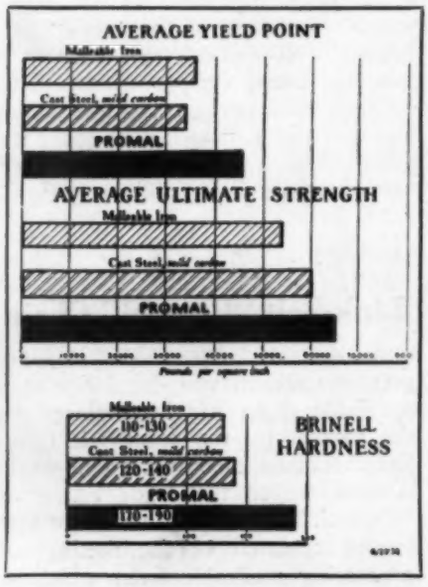
Compared with malleable iron,




Sample link of Link-Belt "Promal" Chain

"Promal" has an average yield point of 47,000 lb., as against 36,000 lb.; an average ultimate strength of 67,000 lb., as against 54,000 lb.; an average elongation of 14 per cent, as against 18 per cent; and a Brinell hardness of 170-190, as against 110-130. Compared with mild cast steel, annealed, "Promal" has an average yield point of 47,000 lb., as against 34,000 lb.; an average ultimate strength of 67,000 lb., as against 60,000 lb.; an average elongation of 14 per cent, as against 26 per cent; and a Brinell hardness of 170-190, as against 120-140.

"Promal" has great toughness to resist extreme tension without permanent stretch and hardness that affords great resistance to abrasive wear. In addition, "Promal" is tough and ductile so that it withstands shock




**Comparison of physical properties and Brinell hardness of "Promal" with malleable iron and steel**

and fatigue loads. Temperatures up to 1,000 deg. F. will not cause it to become brittle.

"Promal" chains are recommended for four general classes of service: (1) chain drives, elevators and conveyors operating under gritty or abrasive conditions; (2) chain drives where greater strength is required than the corresponding size of malleable iron chain provides; (3) drag, scraper and flight conveyors where the chain drags and is subject to abrasion, and (4) heavy-duty drives of comparatively high speeds, short centers, and large sprocket ratios.

# Besly No. 49-53 Wet and Dry Grinder with Power Oscillated Tables

Either wet or dry grinding may be employed on the No. 49-53 grinder with power oscillated tables announced by Charles H. Besly & Company, 118-124 No. Clinton St., Chicago, Ill. The machine is of the motor-driven type requiring a 40-hp., 220- or 440-volt, 3-phase, 60-cycle, 450 r.p.m. a.c. motor, with automatic starter and push-button control. The spindle is mounted on two radial and one thrust bearing. The spindle is 3.937 in. in diameter at the upper bearing, whereas the wheel collar is 24 in. in diameter and has a 12 in. diameter circle for the driving screws.

The motor is cooled by means of impellers on the wheel collar that draw the air up around the stator and discharge it through ducts in the housing. The water tank surrounding the machine has a capacity of 70 gal. Sludge is removed through openings in the side of the tub, which is accessible for cleaning at any time.

The two geared, level-feed tables are mounted on vertical shafts 4½ in. in diameter and operated by means of two motor-driven worm-gear reduction drives connected to the vertical shafts by steel connecting rods. The oscillating fixture is driven by a 1½-hp., 220- or 440-volt, 3-phase, 60-cycle, a.c. motor. Water is supplied to the machine by 1¼-in. "Fulflo" motor-driven pump unit with a 1-hp., 1,800 r.p.m., 220- or 440-volt, 3-phase, 60-cycle, a.c. motor. The geared lever-feed tables have a special spring feed and lock out arrangement so that the operator can take care of both tables.

When wet grinding is required the machine is equipped with suitable water hoods, reducing the splash to a minimum. Each station is provided with an adjustable loading platen for chucking the work in the fixture. The steel disk wheel is drilled and tapped for steel-back abrasive disks and the machine will accommodate such wheels up to 2 in. in thickness. By using a special fixture, dimension work can be ground, and also work where the faces are at right angles to each other.

When dry grinding is employed the breeching to the exhaust system is attached to the opening at the rear of machine, the front opening being sealed with felt strips. The cover can be removed at any time for cleaning out the heavier particles. Water is delivered to the disks through the pipe shown in the rear and the nozzle

**Two geared lever-feed tables having power oscillation are mounted on the Besly No. 49-53 Wet and Dry Grinder to effect production of 125 pieces per hour**

has a row of $\frac{5}{16}$-in. holes drilled at intervals. Water is delivered at high pressure, thus removing grindings effectively from the disk. A dressing device for the wheel is mounted conveniently on the left-hand vertical shaft and can be used at any time.

Production on castings of the types shown in the illustration may reach 125 pieces per hour.

## Jarecki No. 8-HD High-Speed Pipe Threading Machine

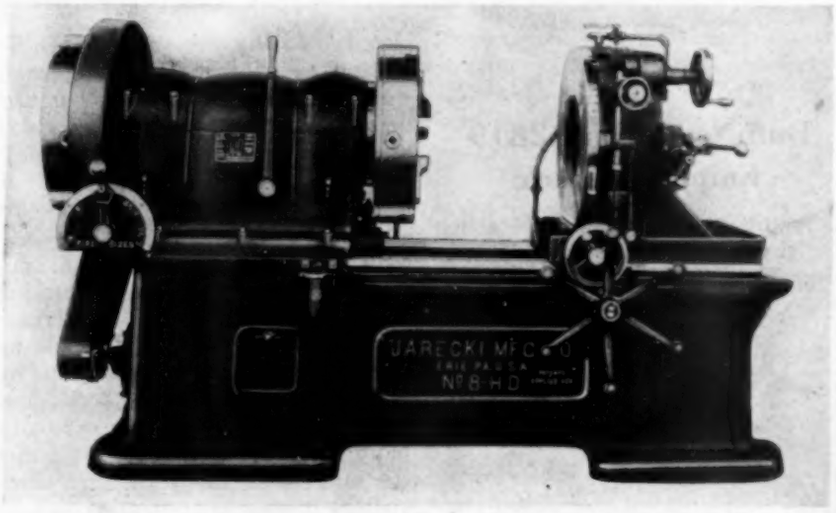
No changing of chasers is required in changing over the Jarecki No. 8-HD high-speed pipe threading machine for pipe of different sizes. The machine, announced by Jarecki Manufacturing Company, Erie, Pa., employs one adjustable, self-opening diehead which covers the entire standard range of 2½ to 8 in., as well as the extra range of 1½ to 2 in. pipe threads. A forged steel trigger, extending inside the diehead, opens the die automatically when the correct length of thread has been cut. This trigger may be set quickly for any length of thread desired, by means of a thread-length dial on the diehead. It is calibrated in ¼-in. stages and for the Briggs standard. The trigger recedes completely out of the way when the chasers are open, and returns to position again when the chasers are are closed. When desired, the chasers can be drawn back by hand independently of the automatic opening device. The 8-in. machine gives an average threading speed of 29 ft. per minute and cuts off 8-in. pipe at 100 ft. per minute.

Small chasers are held rigidly in large die-holders, and are only 2¼ in. wide, thus effecting savings in tool steel. When changing the chasers become necessary, the operator is required only to take out the tapered screw in each chaser. The chasers are set exactly to the size of pipe to be threaded by means of a hand-wheel placed on the diehead. This handwheel revolves the camplate. It is plainly marked for each pipe size in the range of the machine.

The operator can select quickly from the six spindle speeds, the best speed for the size of pipe in hand. A speed-change dial is provided with the pipe sizes marked plainly. Quick changing from any threading speed to "high" for cutting off and reaming speeds is effected by means of a long lever. A multiple-disk clutch eliminates clash or jar, and makes gear-changing smooth and easy.

A gear-driven, reversible pump forces 16 qts. of clean oil to the diehead per minute. The 9-in. spindle bearings are lubricated positively by means of a chain which brings oil from the reservoir and the cut steel gears employed dip in an oil bath. Timken tapered roller bearings are used throughout the unit. The cutting-off block, instead of being mounted in a loose member, is mounted securely in a slot cut directly in the back of the diehead support. This construction affords rigidity.

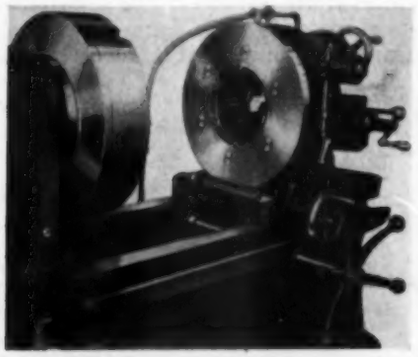
At present 8-in. 6-in., and 4-in. models are available, and a 12-in. size is to be built later.



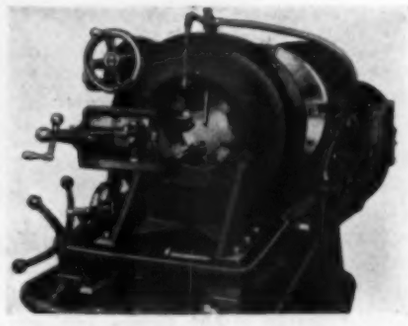

**Convenient control and an adjustable, self-opening diehead permit high speed operation of the Jarecki No. 8-HD Pipe Threading Machine**

## Westinghouse "Flex-Arc" Welding Electrodes

General-purpose steel-welding electrodes have been evolved by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. It is claimed that reduced metal spattering is effected by the use of these "Flex-Arc" electrodes, thus assuring a quiet, stable, and flexible arc at both extremely low and high current values. Both vertical and overhead welding may be done. These electrodes have a uniform melting rate which gives



**Face of the automatic, self-opening diehead showing the thread length dial and the hand wheel which sets the dies to the proper size**



**The automatic trigger is placed at the center of the die opening**

quick penetration and a well fused bead that blends with the general appearance of the completed product.

Welds made by these electrodes are easily machined and are free from slag, oxidation, and gas inclusions. Tensile strengths range from 55,000 to 60,000 lb. per sq.in.

"Flex-Arc" dull-coat and bright-coat finished electrodes are manufactured from basic open-hearth steel and are packed in standard 50-lb. bundles. They are available in the following sizes: $\frac{1}{16}$, $\frac{5}{32}$, $\frac{1}{8}$, $\frac{5}{32}$, $\frac{5}{16}$, and $\frac{1}{4}$ in. The bundles are securely packaged to withstand rough use.

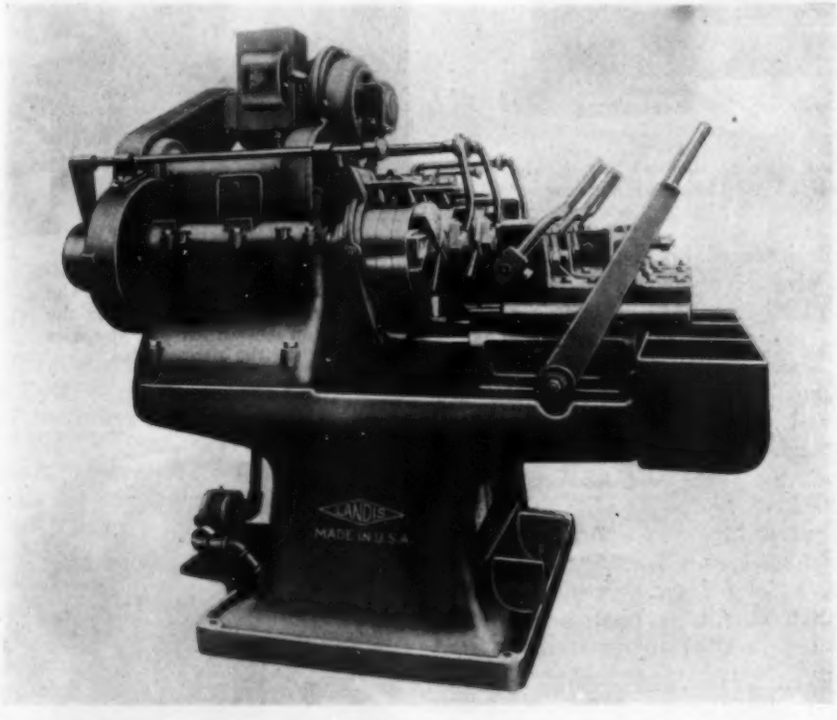
## Landis "Bolt Factory" Threading Machine

A triple-spindle, high-production bolt threading unit is being placed on the market by the Landis Machine Company, Waynesboro, Pa. The machine has been recently redesigned to include a constant-speed motor drive and a pick-off gearbox. With the use of the latter it is possible to obtain the most efficient threading speed for any particular job. Fifteen threading speeds ranging from 38 to 271 r.p.m. are available when using eight sets of interchangeable gears. Other speeds can be obtained by the substitution of different gears.

All shafts in the gearbox are made of alloy steel and are mounted on anti-friction bearings lubricated by the Alemite system. The constant-speed motor is direct connected to the gearbox by means of a silent chain.

A low-speed, low-pressure, large-volume pump, belt driven from a constant-speed shaft, floods the chasers and work with coolant. The entire coolant system has been redesigned to give a larger volume of coolant to the work at all cutting speeds.

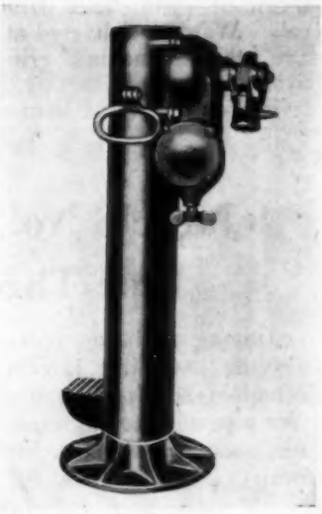
The machine is made in 1-in. and 1½-in. triple-spindle models.




**Redesign of the Landis 1-In. and 1½-In. Triple-Spindle "Bolt Factory" Threading Machine includes a constant-speed motor drive and a pick-off gearbox**

## Duff-Norton No. 2819 Empty Car Jack

Speedy operation and safe action are characteristics of the governor-controlled, self-lowering jack for empty car work which has been placed on the market by the Duff-Norton Manufacturing Company, Pittsburgh, Pa. In lowering it utilizes a governor mechanism which assures control of the lowering speed. The jack may be slowed down or stopped instantly without shock or strain.



**Duff-Norton No. 2819 Empty Car Jack, which employs a Timken roller bearing in the head**

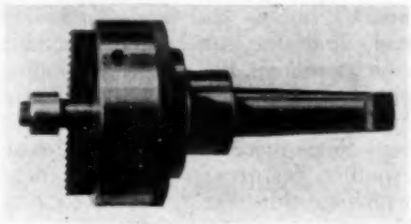
Among the features are: a one-piece shell which permits all working parts to be self-lubricated in a grease packed housing; easy operation by one man; safe, fast lowering by means of the thumbscrew lock; uniform lowering assured when two or more of these jacks are used under the same load; and a footlift, which enables convenient spotting where there is not sufficient clearance to place the top of the jack under the load. The height of the No. 2819 jack is 28 in.; the elevation of the head, 17 in.; diameter at the base, 10 in.; diameter of head, 4¾ in.; and weight 109 lb.

## Mummert-Dixon Compound Spot Facing Tool

Quick and accurate facing of small bosses may be done with the compound spot facing tool announced by the Mummert-Dixon Company, Hanover, Pa. This compound tool consists of a removable pilot stem, roughing cutters, and finishing cutters. The roughing cutters have serrated or

saw-tooth cutting edges, which quickly and easily break up the hard rough scale on cast iron or steel. These roughing cutters are movably arranged in the head so their cutting faces may be set ahead of the finishing cutters and quickly and easily drawn back so the finishing cutters project for the final operation. This withdrawal of the roughing cutters is accomplished without stopping the machine. It is done by turning the knurled adjusting ring. The finishing cutters are maintained always in sharp condition to assure accurate work. For the next operation the roughing cutters may be returned to the working position by turning the adjustable ring in the opposite direction.

Any size thimble may be placed on the pilot stem to fit any size hole in the boss. An auxiliary pilot post can



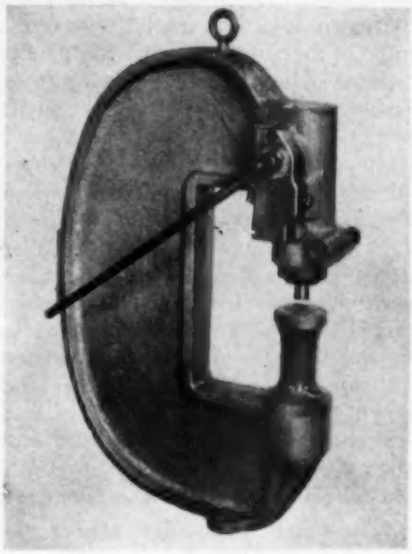
**Mummert-Dixon Compound Spot Facing Tool which has retractable roughing cutters**

be used when the hole in the boss is rough cored or is too large for the regular pilot on the head. The auxiliary post may be fastened to the drill press table and extended up through the hole in the boss, thus acting as a steady for the spotting tool. The heads are furnished with standard Morse taper shanks and in sizes from 2½ to 6 in. in diameter.

## Messinger Portable Hydraulic Web Punch

Holes up to 1 1/16 in. in diameter can be punched through 1-in. plate by use of the hydraulic web punch announced by Messinger Bearings, Inc., D St., above Erie Ave., Philadelphia, Pa. This is effected by applying a 110 lb. pressure at the end of the 30-in. pump handle. With each stroke of the handle the ram travels approximately 3/32 inch.

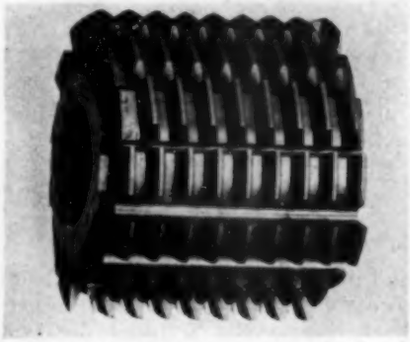
The hydraulic web punch consists



of two main parts, the pump and the yoke. All working parts are removable and interchangeable. The punch is designed with a system of valves whereby a unit hydraulic pressure of 30,000 lb. per sq.in. can be developed and maintained.

## Barber-Colman High-Production Hob

Wider tips on the teeth are featured on the high-production hob announced by the Barber-Colman Company, Rockford, Ill. These wider teeth are the result of assuming a smaller pitch diameter for the gear to be cut than the actual pitch diameter, and laying out the profile of the hob tooth on the basis of this assumed diameter. Thus the pressure angle of the hob has been made smaller than the pressure angle



**Wider tips of the teeth, unequal clearances on the sides, straight gashes, and considerable hook are unconventional features of Barber-Colman High-Production Hob**

of the generated gear, giving wider tips to the teeth, and making them narrower at the base, without disturbing the outline of the generated gear teeth. This deliberate distortion permits more metal at the point of greatest cutting effort.

Unequal side clearances on the teeth are another feature. The leading side has less clearance than usual and the leaving side more, thus producing, it is claimed, a more uniform cutting action on both leading and leaving sides and obviating a dragging effect on the leaving side.

To further increase the smoothness of cutting action, two other innovations in construction are employed. The first is that straight gashes are used, producing teeth having faces at an angle with the line of the lead helix, thus giving a shearing effect on the leading edge and top of each tooth. The added clearance also improves the cutting action of the obtuse-angled leaving edge. In addition, the teeth are sharpened with a considerable hook instead of the customary radial face. The outline of the hob tooth was disturbed by the hook and straight gashes and it was found necessary to make a compensating distortion in the tooth form. It is claimed that these unconventional features permit the hob to give higher production, and the hobbing machine itself will consume less power.

## Porter-Cable Type 0-4 Bench-Type Oscillating Spindle Sander

Much time in sanding operations on all kinds of curved, irregular and angular internal work on wood or metal may be saved by the use of the Type 0-4 bench-type oscillating spindle sander announced by The Porter-Cable Machine Company, Syracuse, N. Y. Suitable abrasives can be furnished for wood or metal work. The tool is especially useful on all small corebox patterns and does away with much hand gouging. In addition, cam pattern and gear-cover work are simplified with this machine.

The Type 0-4 unit supersedes the Type 0-3 and several important changes have been made. The split-phase motor has been replaced with a ¼-hp., specially built, repulsion-induction motor, which can be run on

Curved, irregular, and angular internal work on wood or metal can be handled on the Porter-Cable Type O-4 Bench-Type Oscillating Spindle Sander

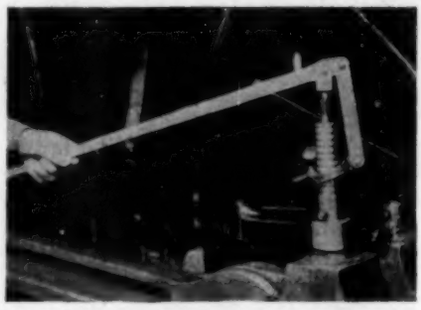
either 110 or 220 volts. A longer motor shaft of $\frac{5}{8}$ in. diameter extends through the spindle. A $\frac{3}{4}$-in. steel sliding sleeve fits this spindle and is driven by the motor shaft, which is square at the top. This eliminates small keys and keyways.

The table is supported by a segment which gives perfect centering, this segment being marked in degrees and allowing the table to be tilted down 45 deg. Thus accurate drafts or angles can be obtained quickly. The spindle oscillates 90 times per minute and has a $\frac{1}{2}$-in. travel. It revolves at the same speed as the motor, which is 1,725 r.p.m. The entire machine is of ball bearing construction, including the motor and oscillating trunnion.

## "Spee-D" Universal Grease Gun

Pressures up to 5,000 lb. per sq.in. can be exerted and grease of hard consistency can be used with the "Spee-D" terminal gun developed by the Reliance Machine & Stamping Works, New Orleans, La. Locomotive connecting rod bearings are a particular application of this device. The gun can be attached and the bearing lubricated in less than 30 seconds. The device functions with the connecting-rod in any position it may take when the locomotive stops. Furthermore, it can be used either vertically or horizontally with equal efficiency. The cylinder of the gun is designed to accommodate a convenient size of grease stick, 5 in. long, and the lever can be used for full or short strokes, as may be necessary when the operating space is limited.

Standard "Spee-D" fittings or filler necks give a quick permanent connection to which the gun is attached quickly. The latter are threaded to fit any size cup and may be installed by screwing into the rod cup and down to the hexagon shoulder. A ball check closes the grease inlet with the expansion of grease and prevents waste. The bottom of the filler neck is counterbored to increase the grease capacity of the cup.



"Spee-D" Universal Grease Gun shown applied to a standard filler neck on a locomotive connecting rod bearing

## Gray "New Series" Metal Cutters

Two improved models in the "New Series" line of Gray metal cutters have been placed on the market by the W. J. Savage Company, Inc., Knoxville, Tenn. The No. 136 is illustrated in Fig. 1 and is the same as the No. 130, except in capacity and depth of throat. The capacity of the No. 130 is $\frac{1}{8}$ in. in mild steel and the No. 136, $\frac{3}{16}$ in., the depths of throat being 30 and 36 in., respectively. The No. 2 roller die type machine shown in Fig. 2 is suitable for cutting large sheets from $\frac{3}{8}$ to $\frac{5}{8}$ in. thick. Either machine will cut any flat shape from soft steel, tough steel, non-ferrous metals, and tough alloys.

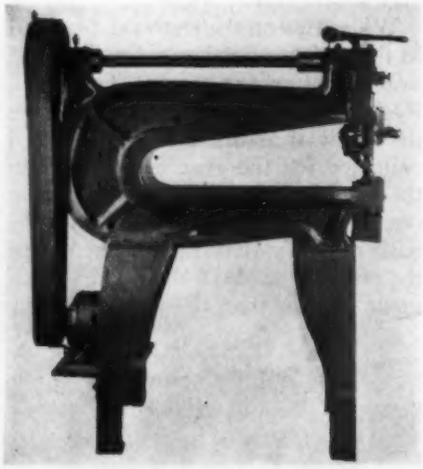


Fig. 1—Gray No. 136 "New Series" Metal Cutter, which has a capacity up to $\frac{3}{16}$ in., and a throat depth of 36 in.

The principal feature of the "New Series" line is the headed nibbling tool, and the toolholder assembly which prevents the tool from pulling out or working loose. The tool bushings permit the tool to be reshaped four times thereby reducing tool cost. Another feature is the turret head which permits the operator to turn the cutting edge of the tool in any direction and so cut any shape without turning the material, a desirable feature when handling large sheets. With the machine can be furnished a tripod cutting table for cutting circles from 2 to 50 in. radius and for cutting straight lines. Steel balls are

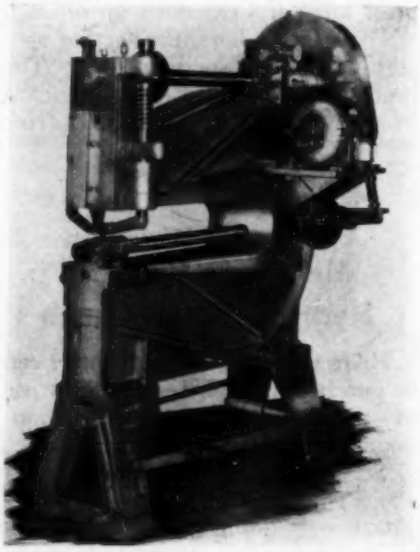


Fig. 2—Gray No. 2 "New Series" Roller Die Type Machine for cutting large and heavy sheets up to $\frac{5}{8}$ in. thick

inserted in the three arms to ease the handling of large sheets.

The roller die type machine has a positive and accurate mechanical feed, which brings the metal under the knife while being compressed between an upper and lower feed roller. It is thus impossible to run off the scribed line.

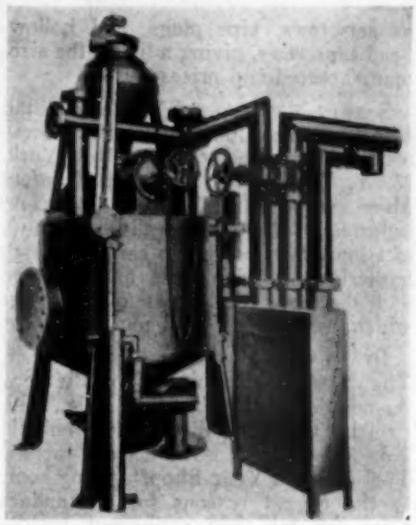
## Oxweld Types NA-3 and NA-4 Acetylene Generators

Two improved types of non-automatic, stationary acetylene generators for supplying large volumes of acetylene have been placed on the market by the Oxweld Acetylene Company, 30 East 42nd St., New York, N. Y. These generators are each made in two sizes having 500-lb. and 1,000-lb. carbide capacity. They are designed for large industrial plants where welding and cutting operations are used extensively, and where oxygen and acetylene are piped to stations convenient to the operators.

The type NA-3 acetylene generator shown is for plants using low-pressure welding and cutting apparatus. It delivers gas to a storage holder which is weighted to supply acetylene to the shop piping system at a pressure of 20 in. of water. In operation, the carbide is conveyed from the hopper to the generating chamber by a rotary feed screw driven by a slow speed reciprocating water motor. The screw, being of cast nickel, is resistant to wear and will not cause sparks.

From the generator the gas enters the wash box, where it passes through a water seal which acts as a scrubber and removes any particles of residue. This device supplants the felt or hair filter usually employed. When residue is being drawn off the generator, the wash box acts as a vacuum release and permits a reverse flow of gas from the holder to the generating chamber to displace the drained water. When the generator is refilled with water, the gas passes from the generating chamber to the holder through this same wash box. An overflow is provided, which limits the water level to give the proper depth to the seal and to permit the functioning of the vacuum release during recharging.

The gas holder may be located either inside or outside the generator house. It is mounted on an automatic water holder shut-off that stops the carbide feed mechanism. When the gas bell approaches its upper limit, this shut-off must be opened by the attendant before the generator will again produce acetylene. Except for this automatic feature, all operations having to do with the starting and stopping of the carbide feed must be performed by the generator attendant. Thus, the carbide feed is not automatically governed by, or interlocked with, the immediate acetylene requirements.



**Oxweld Type NA-3 Acetylene Generator for supplying low-pressure shop systems**

The Type NA-4 generator is similar to the NA-3, but has the addition of an "Oxweld" automatic booster system to deliver acetylene at pressures not above 15 lb. per sq.in. The booster system consists of a booster pump, pressure-regulating by-pass valve, pulsation tank, mercury seal, hydraulic back-pressure valve, electric motor for driving the booster, and power transmission equipment. This booster unit may be had with a capacity suitable for the particular installation.

## Disston "Stronghold" File Handles

Coiled spring-steel ferrules are employed on "Stronghold" file handles to hold the tang of the file rigidly in position. These handles have been placed on the market by Henry Disston & Sons, Inc., Philadelphia, Pa. The coiled spring-steel ferrule and slit end handle permit the use of several sizes of files to one handle.

The "Stronghold" file handle is made from hardwood, in five different lengths and thickness. It is shaped for a comfortable grip and has a smooth, sanded surface. The ferrule end is slit to allow for expansion and contraction when the tang of the file is inserted or removed.

**The five sizes of "Stronghold" File Handles, each of which will take several sizes of files**

## Walden-Worcester Socket Wrenches for Locomotive Washout Plugs

Removal and replacement of washout plugs in locomotive boilers can be effected by the Walden-Worcester socket wrenches announced by Stevens Walden, Inc., Worcester, Mass. The No. 45 set illustrated consists of three heavy-duty, double-square, chrome-alloy-steel sockets,

1¼, 1½ and 2 in., to fit the plugs in common use, together with a combination of connector and sliding bar T-handle. The double-square broached sockets give a new hold on the plug every 45 deg. turn. The crossbar can be located at different distances from the plug in order to clear obstructions and give maximum torque.

# TRADE PUBLICATIONS

GENERAL ELECTRIC PUBLICATIONS. The General Electric Co., Schenectady, N. Y., has issued a series of bulletins as follows: GEA-579A, superseding GEA-579, on "Automatic Full-Voltage Controllers for Synchronous Motors" in low voltage and high voltage series; GEA-708A, superseding GEA-708, on "General Purpose Synchronous Motors, '7600 Series'"; No. GEA-754A on "Semi - Automatic Reduced - Voltage Starters for Synchronous Motors" in high and low voltage series; GEA-785B, superseding GEA-785A, on the "Type AD Drawing-Oven for Drawing Carbon Steel"; GEA-823C, superseding GEA-823B, on "Atomic-Hydrogen Arc-Welding Equipment"; GEA-1052-A, superseding GEA-1052, on "General-Purpose Synchronous Motors, '7500 Series'"; GEA-1201 on "Herringbone Gears"; GEA-1262 on "CR 9504 Operators," or hydraulic rams; GEA- "Thermostat for Industrial Heating Units" and GEA-1266 on the type "CR-7505-A1 Photo-Electric Relay."

MATERIAL HANDLING EQUIPMENT. The Economy Engineering Company, 2673 W. Van Buren St., Chicago, Ill., has prepared a bulletin "Here's Economy for You," showing the application of its material handling equipment in various industries.

RAILROAD EQUIPMENT. The Whiting Corporation, Harvey, Ill., has prepared a railroad equipment catalog entitled "Modern Methods in Repair Shops." It is a most complete exposition of the use of the company's drop pit tables and accessories, electric locomotive hoists, transfer tables, movable loading platforms, electric overhead traveling cranes, and other products. It is more than an ordinary catalog in that it shows the various repair operations and complete information is given showing how these units fit into modern repair shop methods.

SCREWS. The Holo-Krome Screw Corporation, Hartford, Conn., has issued a folder on "Holo-Krome" products such as setscrews, pipe plugs, and hollow-head capscrews, giving a list of the sizes manufactured and prices.

SAFETY MEETINGS. The Metropolitan Life Insurance Co., Policyholders Service Bureau, 1 Madison Ave., New York, N. Y., has issued a booklet "Safety Meetings," which is No. 8 of a series on industrial safety. It outlines methods of stimulating interest in safety through gatherings of employees and foremen and discusses the types of meetings which have been found most effective.

STANDARD MACHINE TOOL GRAY. The National Machine Tool Builders' Association, 1415 Enquirer Bldg., Cincinnati, Ohio, is distributing bulletin No. 811 entitled "Standard Machine Tool Gray in Your Shop," giving some of the cogent reasons for a standard color for all shop equipment besides machine tools.

## Ames Dial Gage for Thin Materials

Rapid and accurate measurement of thin materials can be effected by the dial gage illustrated, which has been placed on the market by the B. C. Ames Company Waltham, Mass. The dial reads to 0.000025 in., and closer measurements can be estimated.

Any size of contact points can be furnished with the dial gage. The jaws are opened by depressing the lower contact by means of the level, releasing it brings the lower contact

up to a predetermined stop, which on material less than 0.002 in. thick gives a zero reading. On material of greater thickness than 0.002 in., the zero reading is obtained by inserting a standard between the contact points, allowing the lower contact point to come against the stop and adjusting the hand of the dial to zero. The gage is finished in black crystalline lacquer and all bright parts are chromium plated.

# PATENTS

**July 23 to 29**

**Tools and Attachments**

Cutting Torch. George C. Quelch, Oakmont, Pa., assignor to International Oxygen Co. *Patent 1,771,511.*

Metal Working. John R. Blakeslee, Cleveland, Ohio, assigned to The Ajax Manufacturing Co. *Patent 1,771,610.*

Process of Forming Compound Metal Bodies. Friedrich Ehrmann, Feuerbach, Stuttgart, Germany, assigned to Robert Bosch Actiengesellschaft, Stuttgart, Germany. *Patent 1,771,620.*

Method of Forming Turning Tool Holders. Edward F. G. Gibbs, Detroit, Mich. *Patent 1,771,709.*

Chuck Arrangement. David Leonard, Swendsen, Norrkoping, Sweden. *Patent 1,771,738.*

Tap and Die Stock. Otto Nelson, Chicago, Ill., assigned to Time Saver Manufacturing Co. *Patent 1,771,811.*

Knee Clamp for Planers. Louis H. Mesker, Shaker Heights, and Jacob Jenne, Cleveland, Ohio. *Patent 1,771,857.*

Hardness-Testing Apparatus. Felix Mohr, Mannheim, Germany. *Patent 1,771,858.*

**Metal Working Machinery**

Automatic or Other Nut-Making and Like Machine Tool. Charles George Garrard, London, England, assigned to Evertite Lock-Nuts Limited, London, England. *Patent 1,771,534.*

Machine Tool, Particularly a Grinding Machine. Karl Jung, Berlin, Germany. *Patent 1,771,540.*

Swaging Apparatus. Paul A. Nelson, Denver, Colo., assigned to The Gardner-Denver Co. *Patent 1,771,548.*

Milling Machine. Edward J. Kearney, Wauwatosa, and Joseph B. Armitage, Milwaukee, Wis., assigned to Kearney & Trecker Corporation. *Patent 1,771,575.*

Machine for Making Bolts, Screws, and the Like. Gustav Arnold, Nuremberg, Germany. *Patent 1,771,833.*

**Furnaces**

Optical Pyrometer. Charles Edwin Foster, Letchworth, England. *Patent 1,771,533.*

Furnace Wall. David S. Jacobus, Montclair, N. J., assigned to Fuller Lehigh Co. *Patent 1,771,850.*

Heat-Treating Furnace. Josef Lundborg, Toledo, Ohio, assigned to The Surface Combustion Co., Inc. *Patent 1,771,853.*

Electric Furnace. Christian Steenstrup, Schenectady, N. Y., assigned to General Electric Co. *Patent 1,771,942.*

# NEWS OF THE WEEK

## Metals Exposition Hours Changed

Changes in the hours of the forthcoming National Metal Exposition in Chicago have been announced by W. H. Eisenman, director of the exhibits. The major change is in the number of evenings during which the show will be open. For the first time the exhibits will be open only two evenings instead of three, as in the past. The exposition will be open from 10 A.M. to 6 P.M. on Monday, Wednesday, and Thursday. On Tuesday and Friday the exhibits may be viewed between noon and 10 P.M. This arrangement provides one additional free evening. Action on the matter was taken by representatives of the sponsor societies in a recent meeting at Atlantic City.

## Cleveland Die Men Form N.D.S.T.B.A. Branch

Necessary organization steps to form a local branch in Cleveland of the National Die & Special Tool Builders' Association were taken on July 7 at a meeting in the Hollenden Hotel. J. R. Fitzsimmons, district manager, Danly Machine Specialties, Inc., acted as temporary chairman, and Secretary George R. Tuthill of the National Association acted as secretary of the meeting. Temporary officers were elected as follows: J. R. Fitzsimmons, temporary chairman; T. L. Galvin, temporary vice-chairman; Wm. E. Millers, temporary treasurer, and Mr. Mertz, temporary secretary. It was brought out at the meeting that there are approximately 80 firms in the Cleveland territory eligible for membership and all have been invited to attend a later meeting at which time permanent officers are to be elected.

Among those in attendance were R. H. Freitag of the R. H. Freitag Manufacturing Co.; R. D. Faris of the American Tool & Gauge Co.; J. Halen of the General Die & Tool Co.; M. Meyer of the Maurice Meyer Co.; H. J. Hoenes of the Hoenes Engineering Service, Inc.; H. Schlager of the Brooklyn Machine Works; Wm. E. Millers of the Enterprise Tool Co.; O. Kernspecht of the Variety Machine & Stamping Co.; F. W. Kramme of the Kramme Machine & Tool Co.; T. L. Galvin of the Die Engineering Works; J. R. Fitzsimmons; F. Browett of the Triangle Tool & Die Co.; W. H. Summerfield of the Industrial Tool Co.; R. W. Decker of the C. F. LaGunke Co., Inc.; A. E. Shepard of the Sommer & Adams Co.; P. E. Maenner of the Hoenes Engineering Service, Inc.; G. H. Thompson of the Cleveland Metal Stamping Co.; and G. R. Tuthill, secretary of the national association.

## Valve Manufacturers Join Standards Association

The Manufacturers Standardization Society of the Valve and Fittings Industry has just become a member-body of the American Standards Association. The Society will now be represented on the ASA Standards Council and will share in the direction of national standardization activities. This society has been co-operating on ASA projects. master.

**NOT A FALLEN ROBOT**

**Shop assembly of the manifold for the City of Tacoma's Cushman No. 2 power project. The manifold is 17 ft. in diameter with three 10½-ft. branches, entirely of riveted plate work, and probably the largest so far built. The Western Pipe & Steel Co. of California built it**

## S.A.E. Plans Aeronautic Meeting

The Society of Automotive Engineers, in conjunction with the Aeronautical Chamber of Commerce of America, will hold a three-day aeronautic meeting at the Palmer House, Chicago, during the National Air Races, August 26-28. The session on the morning of Aug. 26 will feature two papers on engines. The session in the evening will have two on airplane design. Two more airplane design papers will be presented the following morning and operating characteristics during the remainder of the session on that day and the following one. The aircraft banquet will be held at 7:30 on the evening of Aug. 28 with William B. Stout as toastmaster and the address of the evening by Senator Ford.

## Fifteen Simplified Practice Programs Adopted in Year

According to announcement by Edwin E. Ely, chief of the Division of Simplified Practice, Bureau of Standards, fifteen additional simplified practice recommendations were developed by industry during the fiscal year ending June 30, 1930, bringing the total number of general conferences to date to 127. Three of these recommendations were approved at general conferences of the industry concerned during the quarter just ended. The various industries have to date approved and adopted recommendations covering 113 commodities, while others are in the process of acceptance. Surveys of production conducted on 25 simplification programs during the past fiscal year showed an average degree of adherence of 86.7 per cent. During the preceding year, the percentage for 26 commodities surveyed averaged 85.4 per cent.

## Engineers' Aviation Day During Air Races

The Chicago section of the A.S.M.E. in co-operation with the Aeronautic Division has planned an Engineers' or Industrial Aviation Day on Aug. 25, during the Air Races to take place in Chicago from Aug. 23 to Sept. 1, at the Curtiss-Wright-Reynolds Airport. A morning session will be held at the Airport in a part of the Airport Restaurant, when two papers will be presented. Aviation celebrities will be guests at the noon luncheon and the afternoon will be given over to watching the air races. In the evening there will be a special technical session at the Hotel Sherman which will cover three subjects on airplane design.

# June Metal-Working Machinery Exports Better Than Those of Last Year

PAUL WOOTON
*Washington Correspondent*

WASHINGTON, D. C., Aug. 6—A sharp drop in exports of machinery took place in June, figures which just have been compiled by the Department of Commerce show. Machinery exports in June were valued at $66,856,917. This is nearly $40,000,000 less than total exports in June, 1929, and a decline of $16,000,000 over exports in May, 1930.

For the six months ended with June, 1930, the value of all exports of machinery was $518,666,149. This compares with $671,625,157 during the first six months of 1929.

Power-driven metal-working machinery did not follow the general trend. June exports show a material increase over June, 1929, but they fell off $1,000,000 as compared with May exports. For the first six months of 1930, however, they are materially ahead of the first six months of 1929. Metal-working machinery valued at $21,985,152 was exported during the first six months of this year. Exports during the corresponding period of 1929 totalled $17,128,490. The accompanying table shows the quantities of the principal items exported under power-driven metal-working machinery.

| | June, 1929 | June, 1930 |
|---|---|---|
| Engine lathes | 65 | 103 |
| Turret lathes | 34 | 73 |
| Other lathes | 82 | 75 |
| Vertical boring mills and checking machines | 7 | 19 |
| Thread cutting and automatic screw machines | 82 | 55 |
| Knee and column type milling machines | 32 | 40 |
| Other milling machines | 76 | 74 |
| Gear cutting machines | 41 | 69 |
| Vertical drilling machines | 36 | 38 |
| Radial drilling machines | 9 | 23 |
| Other drilling machines | 81 | 83 |
| Planers and shapers | 47 | 27 |
| Surface grinding machines | 34 | 13 |
| External cylindrical grinding machines | 44 | 49 |
| Internal grinding machines | 41 | 12 |
| Tool grinding, cutter grinding and universal grinding machines | 177 | 182 |

The comparative figures covering the major divisions of machinery exports are shown by the following:

| | | |
|---|---|---|
| Electrical machinery and apparatus | $10,203,113 | $9,714,659 |
| Industrial mchinery | 21,355,044 | 21,095,093 |
| Power generating machinery, except electric and automotive | 2,119,347 | 1,733,424 |
| Construction and conveying machinery | 2,096,049 | 2,603,820 |
| Mining, well and pumping machinery | 4,286,735 | 4,527,596 |
| Power driven metal-working machinery | 3,093,046 | 3,379,841 |
| Other metal-working machinery | 724,403 | 517,797 |
| Textile machinery | 1,024,152 | 705,026 |
| Sewing machines | 842,620 | 613,070 |
| Other industrial machinery | 6,914,292 | 6,757,132 |

Aeronautic exports for the six months ending June, 1930, were valued at $4,812,720, a sum only $318,161 less than the valuation for the same period of 1929, although foreign trade during that year assumed such proportions it was feared the present market might be weakened.

Exports of agricultural machinery from the United States reached a new high level during the first half of the current year, according to the Agricultural Machinery Division, Department of Commerce. Shipments during this period totaled $78,997,334, as compared with $72,068,581 for last year.

Exports of tractors and parts as usual made up the bulk of the exports of agricultural implements. During the first half of 1930, the total tractor shipments amounted to $49,852,449 or 62 per cent of the total shipments of all implements. This amount is an increase of 38 per cent over 1929.

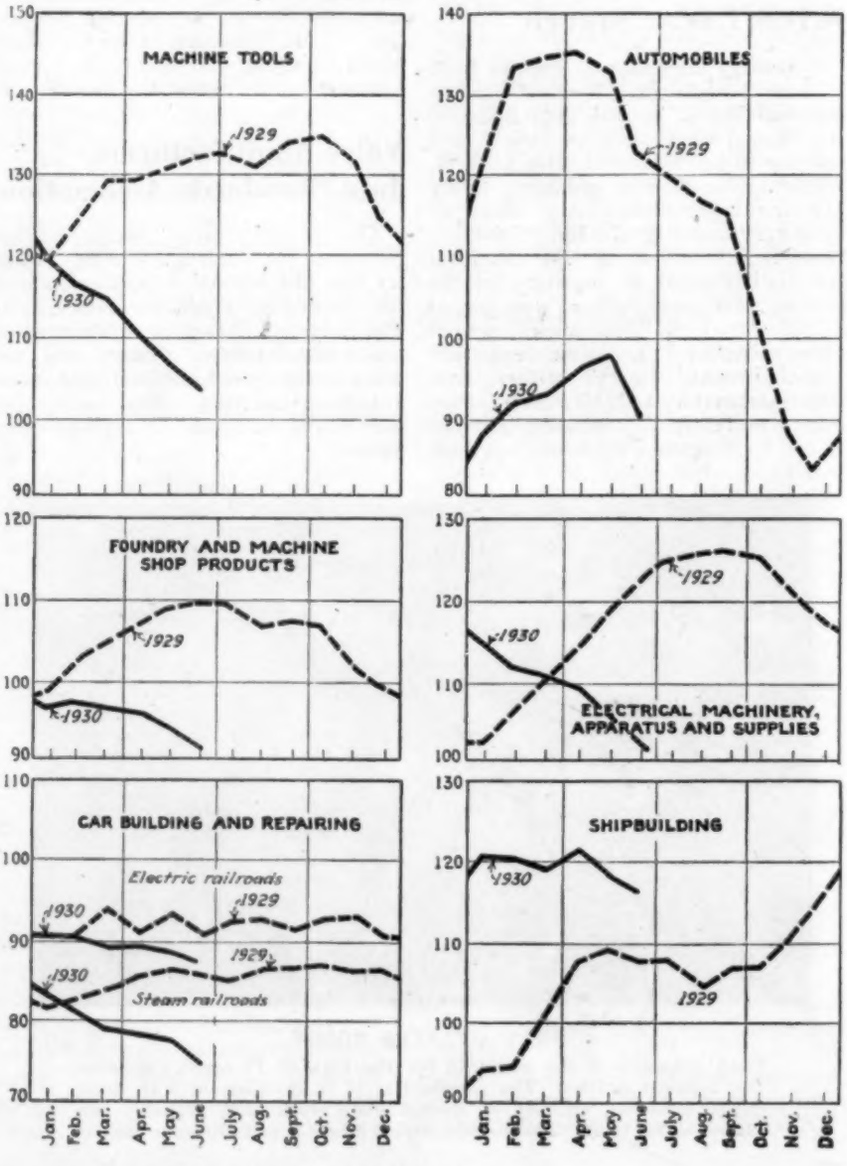
Farm implement manufacturers already are feeling the results of the country-wide drought. A number of plants manufacturing tractors and allied equipment closed down for inventory early in July, almost a month before their ordinary inventory period.

Commerce Secretary Lamont is being urged to move the assignment records of the Patent Office into the Department's new building so as to eliminate the serious fire hazard which now hangs over these invaluable records.

# Trend of Employment In the Metal-Working Industries

**Data Supplied by the Bureau of Labor Statistics**

**Monthly average for 1926 = 100**



## Maj. Aaron E. Carpenter Makes a Survey Abroad

Maj. Aaron E. Carpenter, first vice-president, E. F. Houghton & Co., Philadelphia, has just returned from an extended business survey in France, Germany, Poland, Russia, and England. When asked how he found business conditions in Europe, Major Carpenter stated, that, on the whole, business was only fair, inclining to poor in some sections.

"In France, business conditions are quite fair," he said, "with little or no unemployment. However, at the time of my stay in France, a considerable amount of pessimism was in evidence in regard to America's high import taxes and their probable effect on French exports to the States under the new American tariff bill, which, at the time, had not been passed."

In Germany, Major Carpenter found conditions considerably worse than on his previous business trips in 1928 and 1929. "Last year's big metal strike, while settled in December, effected industry to such an extent that its ill effects are still in evidence on all sides. Then, too, the present American industrial depression has now reached Ger-

**Major Carpenter**

many with the result that there is considerable unemployment. There seems to be a decided lack of confidence on the part of German manufacturers and industrial leaders in the present socialistic government. This factor does not promise rapid re-stabilization of German industries."

Major Carpenter's itinerary did not provide for a long stay in Poland, therefore, he did not have an opportunity to study its industrial conditions very closely. However, it appears that business and industrial conditions are quite fair. Prices, particularly in Warsaw, are considerably below those in France and Germany.

"Russian industry has made some great strides in the last couple of years," reports Major Carpenter. While he left Russia less of a Bolshevik than when he entered, nevertheless, the present government is very progressive and deserves much credit for the constructive work it is doing. He states, further, that the "Five-Year Program" is well ahead of schedule, and general conditions are really much better than one would infer from American newspapers.

"Considering the many problems which England has to face, business conditions in Great Britain can only be labelled as 'uncertain,'" states Major Carpenter. "There is a terrific amount of unemployment, but, at the same time, business conditions in general, and production in particular, seem to be better than in the States. The unemployment situation probably never will be remedied, as England is over-mechanized and over-populated. The so-called 'dole' seems to be the one factor which is keeping the country on what might be called a 'stable level' and has saved the country from serious complications.

"As in Germany, a great deal of uncertainty prevails in England. High taxes are the source of much dissatisfaction. These appear to be decidedly higher than in either France or Germany."

Major Carpenter stated, in conclusion, that L. E. Murphy, president of E. F. Houghton & Co., has just sailed for England to decide definitely the site of a new works there and to make a general tour of inspection.

## A Measuring Stick For Business

C. A. Moore
*President,*
*Manning, Maxwell & Moore, Inc.*

(From a letter to company executives)

We have had eight months of serious business depression. This company has felt it in diminished sales and in smaller net earnings. There is every reason to believe that the worst of this business depression is over. But we are sure to feel its effects for some weeks to come.

Business has a very simple measuring stick—net earnings. And at a time like this executives apply this measure of success far more carefully and exactly than in highly prosperous times. Favorites are played sometimes when everything is going very well. Winners are the ones that are played in times of business stress. During the coming months it is certain that more and more exacting scrutiny will be given every department and individual in this company, as well as in every other company in the country.

Good past performances are only valuable if surpassed by better present and future performance, judged in results—net earnings and contributions to net earnings. No man could ask for a better break than to be judged by this fair and universal standard of measurement.

We are in competition with more and more capable, enterprising and aggressive, more scientific and far-seeing men and corporations every year. Their standards of performance are growing higher and higher, just as standards of performance are growing more and more exacting in every activity of life from sports to warfare. To win in such speedy company is more and more an honor!

There is no employee of our corporation who has ever reached his maximum performance yet. We all have capacities far beyond our own most optimistic beliefs. If we, as a whole, employed all of our latent talents as intelligently and energetically as we could, our company would prosper equally in good times or bad; and every man in our organization would be twice as prosperous as he is now.

A period of business depression is a time for drastic overhauling of ourselves, a time for immediate improvement, for added energy and resourcefulness and guts. There is too much wealth in this country, too many able and courageous men for any slump in business to last long. And it is a great satisfaction for all who emerge from a business depression with the realization that *they* did all they could to end it by work and optimism.

## Financial Notes

The Mesta Machine Co., West Homestead, Pa., reported a record net of $1,271,000 for the first half of 1930, after all charges, including depreciation and federal taxes have been deducted. This is equivalent to $2.03 a share on 600,000 shares of common stock outstanding. Net for the first half of 1929 was $934,120, equivalent to $1.46 a share on the same share basis.

The Timken Roller Bearing Co., Canton, Ohio, reported net earnings for the first six months of this year of $6,120,023.83, or $2.54 on each of the 2,413,967 shares. This represents a decrease under the net earnings for the similar period in 1929 when profits amounted to $8,449,198.41. This makes a reduction per share from last year amounting to $0.96.

The General Motors Corporation, New York City, reports net operating profits for the first half of the current year of $98,355,355. This is equivalent to $2.15 a share on the common stock after preferred dividends, and compares with earnings of $151,860,310 or $3.38 a share for the first half of 1929.

Earnings approximately the same for the first half as for the first six months of 1929, $1,099,428, are shown by the Worthington Pump & Machinery Corporation, despite the fact that billings have been smaller.

Sales billed by the General Electric Co. for the first six months of 1930 amounted to $197,229,346, as compared with $194,353,307 for the corresponding period last year, according to an announcement by Gerard Swope, president. Profit available for dividends on common stock for the first six months was $29,273,276 as compared with $30,740,768 for the same six months last year.

# BUSINESS ITEMS

The Motch & Merryweather Machinery Co., First National Bank Bldg., Cincinnati, Ohio, recently elected the following officers: E. R. Motch, president; E. R. Motch, Jr., secretary and assistant general manager; Stanley Motch, treasurer; and A. B. Einig, general manager.

The General Electric Co., Schenectady, N. Y., announced recently that more than 75 per cent of the eligible employees have voted to participate in the new General Electric Employes Unemployment Plan.

The Taylor-Wharton Iron & Steel Co., High Bridge, N. J., has a number of improvements under way. Two foundry buildings, 80x20 and 130x50 ft., are included in the plans, which also include new sand handling and conditioning equipment.

The Strombeck-Becker Manufacturing Co., Moline, Ill., re-elected officers at the annual meeting of stockholders as follows: J. F. Strombeck, president; G. M. Strombeck and R. D. Becker, vice-presidents; T. H. Becker, treasurer; and David Torsell, secretary.

The Cartwright Automatic Gear Shift Corporation, Indianapolis, has acquired a factory site at the Industrial Center and production will start immediately.

The Federal Products Corporation, Providence, R. I., is opening its own branch office at 50 Church St., New York City, where a stock of indicators and gages will be carried. R. M. Coldwell will be manager of the branch. Mr. Coldwell was formerly sales manager of the B. C. Ames Co.

A. Leschen Rope Co., manufacturer of wire rope and wire rope tramways, St. Louis, Mo., has moved the Pacific Coast offices from the Monadnock Building to 520 Fourth St., San Francisco.

The Appleton Electric Co., Chicago, is erecting a two-story addition to its Wellington Avenue plant. The structure, 90x90 ft., will connect two units of the present factory.

The Michigan Gear & Engineering Co., Detroit, has awarded a contract for the design and construction of a machine shop, 62x128 ft., of steel frame construction and to cost about $25,000.

L. J. Byrne, 9 S. Clinton St., Chicago, has been appointed representative of the Magnetic Manufacturing Company, Milwaukee, in the Chicago territory. Mr. Byrne will handle the entire line.

General Motors Corporation has announced that it will move its Fleetwood automobile body-building plant from Fleetwood, Pa., to Detroit. Operation of the plant will cease on August 15.

The Wilcox-Rich Corporation, Marshall, Mich., has begun production of automobile valves after having been closed for some time.

The Reliance Battery Products Co., Council Bluffs, Iowa, has purchased the Cole Battery Corporation, Chicago.

The Electric Auto-Lite Co., Toledo, is abandoning its branch plant at Adrian, Mich.

The Federated Metals Corporation, has moved its offices to 295 Madison Ave., New York City.

The Electric Ozone Utilities Co., Chicago, has been incorporated with $375,000 capital and 100,000 no par shares to deal in machinery and devices.

Dyer Engineers, Inc., with home offices at 1984 Union Trust Bldg., Cleveland, Ohio, has opened a district office at 1405 Henry W. Oliver Bldg., Pittsburgh, in charge of John W. Hacker.

The Canadian Austin Co., Ltd., has secured a plant at 297 Campbell Ave., Toronto, Ont., and will commence operations in a short time. R. P. Clarkson is managing director.

The American Steel Products Co., Macomb, Ill., has purchased additional property near its plant.

The General Range Corporation, Lima, Ohio, has been incorporated with $50,000 in 2,000 no-par shares to succeed the General Range Manufacturing Co., Cincinnati.

The Mayes Bros. Tool & Manufacturing Co., Port Austin, Mich., is reported to be expanding its plant.

The Lux Clock Co., Waterbury, Conn., recently secured a permit for the construction of a 4-story plant addition to cost approximately $50,000.

The Charles Bond Co., 617-623 Arch St., Philadelphia, Pa., has recently acquired the two buildings adjoining its general offices and store.

# PERSONALS

Everett Chapman has been appointed director of development and research of Lukenweld Inc., a division of the Lukens Steel Co., Coatesville, Pa. Mr. Chapman will have general direction of laboratory and investigation work in connection with redesigning of machinery parts for the welded steel type of construction.

George W. W. Cornman, treasurer and manager of the service department of the Brown Instrument Co., Philadelphia, Pa., will retire from business effective Aug. 8. Mr. Cornman has been in the instrument business for 35 years. R. C. Kennan will succeed Mr. Cornman as manager of the service department, and E. T. Nahill will become field supervisor.

R. L. Davis, formerly engineer in charge of radio development for the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has been made manager of the radio engineering department at Chicopee Falls, Mass. V. E. Trouant will succeed Mr. Davis at East Pittsburgh.

Francis A. Emmons, vice-president of the Foote Bros. Gear & Machine Co., 111 N. Canal St., Chicago, Ill., returned recently from a business trip to the West Coast.

B. R. Engelmann, associated with the automotive industry for the past quarter century, has been appointed general manager of the Boyle Valve Co., Chicago.

H. E. Field, formerly president, and general manager since 1914 of the Wheeling Mold & Foundry Co., recently merged with the Duquesne Steel Foundry Co., Pittsburgh, and the Hubbard Steel Foundry Co., East Chicago, Ind., to form the Continental Roll & Steel Foundry Co., Chicago, has been mare vice-president and treasurer.

Edwin Kilburn has reopened his machine shop at Spring Valley, Minn.

E. M. Klapka, recently named to the board of the Roscoe Huller Co., Ft. Dodge, Iowa, was elected president for the remainder of the year at a meeting of the board following a special session of the stockholders at which Mr. Klapka, A. B. Sayles, and Dr. W. F. Carver were elected to the board to fill vacancies. Dr. Carver was named vice-president and L. P. Heldridge and Franklin S. Battin, who complete the directorate, continue as secretary and treasurer respectively. Mr. Battin is sales advertising manager and Mr. Heldridge is production manager.

F. K. Knohl, formerly a truck designer of the Fargo Motors Division, Chrysler Motor Co., Highland Park, Mich., has become research engineer with the Illinois Tool Works, Chicago.

M. H. Krieger has resigned as factory manager of the Durant Motors plant at Lansing, Mich.

G. C. R. Kuiper, formerly chassis experimental engineer with the Stutz Motor Car Co., Indianapolis, has become assistant to the chief engineer, Midland Steel Products Co., Cleveland.

J. M. Lessells, Dr. J. P. DenHartog, Dr. S. Timoshenko, and R. E. Peterson, all of the Westinghouse Research Laboratories, will attend the third International Congress for Applied Mechanics in Stockholm the week of August 25. Mr. Lessells is one of the three engineers officially to represent the United States. He is in charge of the Mechanics Division, Westinghouse Laboratories. Dr. DenHartog, after the Congress, will spend a year in Germany studying under Dr. Ludwig Prandtl. Dr. Timoshenko, Dr. DenHartog, and Mr. Peterson will present papers.

H. Q. Mills, formerly in charge of the West Coast offices of the Anchor Cap & Closure Corporation, Long Island City, N. Y., and the Capstan Glass Co., Connellsville, Pa., has been elected a vice-president of both companies. He

will make his headquarters at the Anchor-Cap general offices in Long Island City. Hugh Crawford will succeed Mr. Mills at the San Francisco office, and Leon C. Lee, formerly manager of the Los Angeles office, will become Mr. Crawford's assistant.

A. R. Heiskell, vice-president and secretary of the Marmon Motor Car Co,, Indianapolis, recently completed 25 years of service as a Marmon official.

A. W. Machlet, president of the American Gas Furnace Co., Elizabeth, N. J., will return the latter part of next month from a European trip.

George F. Nye, president of the Dobbie Foundry & Machine Co., Niagara Falls, N. Y., has been elected a director of the Power City Trust Co.

A. G. Plimmer, formerly machine designer, National Carbon Co., Fremont, O., has become foreman in charge of the experimental department of Cincinnati Grinders Incorporated.

B. F. Shepherd, chief metallurgist for the Ingersoll-Rand Co., Phillipsburg, N. J., returned recently from a visit to England and the Continent.

J. M. Schoonmaker, Jr., vice-president, treasurer, and director of the Standard Steel Spring Co., Coraopolis, Pa., has been elected president of the General Aviation Corporation and the Fokker Aircraft Corporation, aviation subsidiaries of the General Motors Corporation. Mr. Schoonmaker is a director of the Pittsburgh Air Transport Corporation and its five affiliated companies, in addition to being vice-president and director of the Federal Spring Co., Coraopolis.

W. R. K. Scott, metallurgist at the Aliquippa works of the Jones & Laughlin Steel Corporation, Pittsburgh, has been transferred to the general offices of the company as sales engineer on tubular products. J. H. Flaherty, metallurgist at the Pittsburgh works, has succeeded Mr. Scott as metallurgist at Aliquippa. C. C. Henning has succeeded Mr. Flaherty at the Pittsburgh works.

W. W. Slaght, until recently chassis experimental engineer with the Pierce-Arrow Motor Car Co., Buffalo, has become chief engineer of the Cleveland (Ohio) Steel Products Co.

Claude O. Streeter, who for the past 18 years has been associated with Graton & Knight Co. and its subsidiaries as chief mechanical engineer, has resigned to accept a similar position with the Schwartz Belting Co., 76 Murray St., New York City.

George Thomas 3rd, treasurer of the Lukens Steel Co., Coatesville, Pa., sailed from New York on July 25 for a several months trip to Europe.

J. C. Williams, president of the Weirton (W. Va.) Steel Co., sailed recently from New York on the S. S. *Berengaria* for a brief European trip.

# OBITUARIES

M. E. Danford, 54 vice-president of the American Rolling Mills Co., Middletown, Ohio, died recently in Shafton, England, where he had been for four months superintending the opening of a new branch. Mr. Danford joined the Armco organization in 1909 as assistant general superintendent.

Byron O. Brill, 51, purchasing agent of the J. G. Brill Co., Philadelphia, died on July 21 after an illness of several weeks. He was a grandson of John G. Brill, founder.

William D. Foulke, 62, treasurer of the Western Wheeled Scraper Co., Aurora, Ill., died the night of July 23.

Walter C. Bender, vice-president of the Ahlberg Bearing Co. of California, Inc., died on July 9 in Los Angeles.

# FORTHCOMING MEETINGS

THIRD INTERNATIONAL CONGRESS FOR APPLIED MECHANICS — At Stockholm, Sweden, Royal Technical Institute, week of Aug. 25. Further information from A.S.M.E., 29 West 39th St., New York City.

INTERNATIONAL CONGRESS FOR GENERAL MECHANICS — Liege, Belgium, Aug. 31 to Sept. 7. For information address Alb. Schlag, 4 Place Saint Lumbert, Liege, Belgium.

NATIONAL MACHINE TOOL BUILDERS' ASSOCIATION—Cost Conference, Hotel Clifton, Niagara Falls, Ont., Canada, Sept. 22-23. Ernest F. DuBrul, 1415 Enquirer Bldg., 617 Vine St., Cincinnati, Ohio, is general manager.

NATIONAL METAL CONGRESS—Twelfth annual Congress and Exposition, Stevens Hotel, Chicago, Sept 22-26. W. H. Eisenman, secretary of the A.S.S.T., 7016 Euclid Ave., Cleveland, Ohio, is director.

AMERICAN WELDING SOCIETY—Annual fall meeting, Congress Hotel, Chicago, September 22-26. W. M. Spraragen, 29 W. 39th St., New York, N. Y. is technical secretary.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Annual fall meeting of Iron & Steel Division and Machine Shop Practice Division, Stevens Hotel, Chicago, September 22-26. P. T. Wetter, Engineering Societies Bldg., 29 W. 39th St., New York, secretary.

AMERICAN INSTITUTE OF MINING & METALLURGICAL ENGINEERS — Annual fall meeting of Iron & Steel Division, Stevens Hotel, Chicago, September 22-26. T. T. Read, 29 W. 39th St., New York, N. Y., is secretary.

AMERICAN INSTITUTE OF MINING & METALLURGICAL ENGINEERS — Annual fall meeting of the Institute of Metals Division, Stevens Hotel, Chicago, September 22-26. W. M. Corse, 29 W. 39th St., New York, N. Y., is secretary.

AMERICAN SOCIETY FOR STEEL TREATING—Annual Convention, Stevens Hotel, Chicago, September 22-26. W. H. Eisenman, 7016 Euclid Ave., Cleveland.

NATIONAL SAFETY CONGRESS—Nineteenth Annual, to be held at Fort Pitt and William Penn Hotels, Pittsburgh, from Sept. 29 to Oct. 3. Metals Section meetings will be held on Tuesday and Wednesday mornings and Thursday afternoon.

AMERICAN GEAR MANUFACTURERS' ASSOCIATION — Semi-Annual meeting, Hotel Clifton, Niagara Falls, Ont., Canada, from Sept. 29 to Oct. 1.

SOCIETY OF AUTOMOTIVE ENGINEERS — Production meeting, Hotel Book-Cadillac, Detroit, Oct. 7-8. R. S. Burnett, director, production activities, 29 West 39th St., New York City.

GRAY IRON INSTITUTE, INC. — Third Annual Convention at Hotel Cleveland, Cleveland, Ohio, October 8. Arthur J. Tuscany, Terminal Tower Bldg., Cleveland, is manager.

NATIONAL MACHINE TOOL BUILDERS' ASSOCIATION—29th Annual Convention, Hotel Aspinwall, Lenox, Mass., October 13-15. Ernest F. DuBrul, 1415 Enquirer Bldg., 617 Vine St., Cincinnati, Ohio, is general manager.

NINTH NATIONAL EXPOSITION OF POWER AND MECHANICAL ENGINEERING —In Grand Central Palace, New York City, Dec. 1-6.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Fifty-first annual meeting, Engineering Societies Bldg., New York City, Dec. 1-6. Calvin W. Rice, secretary, 29 West 39th St., New York City.

WESTERN METAL CONGRESS AND EXPOSITION—Second National, Civic Auditorium, San Francisco, Calif., Feb. 16-20, 1931. Under auspices of A.S.S.T. W. H. Eisenman, secretary, 7016 Euclid Ave., Cleveland, Ohio.

# THE INDUSTRIAL REVIEW

## Weekly progress of the machinery and machine-tool business

THE following reports, gathered from the various machinery and machine-tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

### NEW YORK

The vacation quiet of the New York machinery and machine-tool market for the past two months continues to be its outstanding characteristic. Dealers report sales of but a few tools, and have little expectation of any change in the situation until Labor Day. Odd orders for single items or for replacement parts are the only entries on the order books. There have been a few inquiries released, principally for single tools required in estimating changes planned "when business improves." The month of July was a duplicate of June in both orders and inquiries, and August is expected to be just another month.

### CHICAGO

Representatives of the machine-tool industry express themselves as of the belief that business in their line may shortly be expected to show signs of improvement. This is predicated on the increasing number of inquiries coming by each mail, which is regarded as significant of preparation on the part of general industry to resume a degree of activity early in the fall. Reports from selling agents, distributors, and dealers are to the effect that July business was the poorest known in several years. It is not believed August will turn out much better, but with the advent of September an upward curve on the machinery sales is confidently looked for. Last week brought an inquiry from the Illinois Steel Co. for a 42-in., 29-ft. bed, heavy-duty motor-driven engine lathe, and from the C.B.&Q. Railroad for a 36-in. crank shaper, a 4-in. heavy-duty drill press, a 7-ft. radial drill and a motor-driven vertical drill press. With these exceptions, inquiry was negligible.

### CANADA

The machinery and machine-tool market in Canada might adequately be described as displaying a mixed trend. The majority of machine-tool manufacturers are operating their plants with a full complement of workers. Steel mills, on the other hand, are only moderately active, and future tonnage is not impressive, as automotive inactivity has affected output adversely. Agricultural implement makers are marking time, with reduced staffs, pending development of crop prospects. Manufacturers of electrical supplies report that conditions are fairly satisfactory. A good market is opening for this trade, as numerous rural power lines are being constructed. Manufacturing, as a whole, is not so active as it was a year ago.

Judging by reports from the various industrial centers, the conviction is growing that the worst of the depression in Canada has been seen and that any decisive change in general conditions is likely to be in the direction of improvement.

### SOUTHERN DISTRICT

Whatever promise of improvement was visioned in the early part of June appears to have received a discouraging setback since the first of July. The second half of the year has gotten off to a poor start, and all indications point to a continuing slow period. Both new and used tool sales have declined, and the inactivity of supply houses seems to be more or less general in Birmingham, New Orleans, and Houston.

Although demand is limited to essential requirements and dealers are waging an offensive and persuasive battle for sales, prices in both the new and used machinery and machine-tool market are holding firm. There is evidence of a surplus of used equipment, but this surplus does not appear to be growing, in view of the cautious selling and trading-in practices adhered to. Deliveries are just about as satisfactory as they have been in recent months. Construction in Louisiana has been surprisingly active, but strangely enough has not reflected in demand for machinery and machine-tools to even a normal extent.

■

**LABOR DAY is being looked forward to as the turning point by the country's machinery and machine-tool dealers, with a few predictions postponing the upturn until the elections have been settled. A rising chorus of predictions of better business is beginning to drown out the dirge of the pessimist. An occasional center now reports the reopening of inquiries more than a year old, with a possibility of sales as soon as the upturn begins.**

**NEW YORK'S dealers still sit twiddling their thumbs as summer wears away, hoping that cooler fall weather will loosen the writing arms of some of their parboiled prospects. Chicago inquiries are picking up, but are still far behind the gang shootings in number. Canada's market is on the fence, present activity of tool manufacturers being counterbalanced by the increasing slowness in steel orders and the inactivity of automobile builders. Southern prospects seem to have lost interest, and there is some evidence of a possible surplus in used tools.**

**CINCINNATI dealers and manufacturers attribute some of their difficulties to Old Sol's successful campaign against Jupiter Pluvius, although a few inquiries may prove to be the silver-lined dark clouds bringing a rain of orders. New England, conventionally canny, is none the less among the first to show improvement. As usual, betterment is indicated in increased employment and longer working hours. Detroit's automobile builders, with their stranglehold on the machine-tool situation there, are merely passing on the public's disinterestedness to the tool sellers.**

### CINCINNATI

During the past month the record-breaking temperatures and drought made it impossible to keep the business morale up to the usual standard, and in these circumstances the best that could be done in the machine-tool industry was to mark time.

No important business was developed, and sales continued at about the previous level. Principal buyers were general machinists and miscellaneous users, orders being confined to single units.

A fair volume of miscellaneous inquiries was received, coming from all classes of users, and largely confined to single tools and replacements.

It is thought that business booked and pending will sustain manufacture at its present level through this month, after which gradual improvement is expected. One manufacturer reported that old inquiries, some of which were received as many as eight months ago, are being revived, with resulting sales.

### NEW ENGLAND

Recent optimistic expressions were partly fulfilled by marked industrial spurts in the New England territory during the current week. Improved activity, while confined to scheduled production of miscellaneous products rather than machine tools, was sufficient to better the situation.

A large electrical company increased its working force 30 per cent in several departments. A Connecticut lock manufacturer is operating four nights a week. The Standard Safety Razor Co., South Norwalk, plans days and night shifts and will double its blade production. Marked improvement in foundry operations was a feature. One ball bearing plant has new orders requiring day and night shifts. A silver plant and a hardware manufacturer announce increased orders and better schedules.

While machine-tool orders have not materialized to any extent from this activity, the situation has become much better balanced. Orders are still at a low level. It seems unlikely however, that August can fail to show some improvement. July was a poor month, the poorest month in years for some companies. The Boston Schoolhouse Department closed bids Aug. 4 for several metal-working lathes.

### DETROIT

There has been little activity in the machinery field in the Detroit area in the past few weeks and no appreciable change is expected before the latter part of August. A few small orders have been received and some inquiries are coming in, but the closing down of the automobile plants during much of July caused almost a complete stagnation of the trade.

The announcement of new models by Buick, Chrysler, and Cadillac has had little or no effect on the industry for the reason that the manufacturers were able to make adjustments to old machinery sufficient to take care of estimated future needs. There is a growing tendency to buy more and more flexible machinery in order that it can be shifted to new uses as automobile models change. In the last few years this tendency has become much more noticeable throughout the industry, largely a result of the increasing need for economy and the more rapid and frequent changes in design of cars.

The small contract jobbing shops are practically idle, and only a few of them expect any work during August. They are buying little or no machinery or tools. Business in general is fairly good and there is a prevailing impression that the turning point has been reached.

# BUSINESS · BAROMETER

## *Improvement will come through continued hard work and the healing processes of time*

THEODORE H. PRICE
*Editor, Commerce and Finance, New York*

THE reflective man sometimes finds himself wondering what sort of a world this would be if the speculative element were eliminated from all business. Certainly it would be a very dull affair. But it is possible that the losses that stabilization would avert might offset the waste represented by the miscalculations of those who go wrong in guessing whether prices would advance or decline.

The question is suggested by a review of last week's stock and commodity markets. One day they would decline, and the next day an advance would follow. Although wheat, cotton, sugar, and rubber temporarily made new lows by a small margin, they rallied later, and the net change in prices at the end of the week is small. As a result there is little interest in the markets, and in business where there is apathy there is usually depression and discouragement also. The disposition is to await developments, though it is a little hard to say what developments there can be except the improvement that will come through continued hard work and the healing process of time which is steadily at work diminishing excess stocks of goods.

But this is not to say that basic conditions are unchanged. The bad news that is now being published relates chiefly to what happened some months ago, while the meager reports of more recent developments indicate a slight improvement in some lines of trade. This is particularly true of the mail-order houses, chain stores, and even of the jobbing trade and some textiles.

The profits of industry during the first half of the year are estimated at nearly 25 per cent less than in 1929, and, of course, dividend payments are smaller. Big production in almost every line has now been smaller than ultimate consumption for many months, and it will not be long before a somewhat larger output can be absorbed.

A good increase in automobile production will take place in August, and the steel and tire trades will be benefited thereby. Engineering construction continues large, and the low state of residential building is of course a characteristic of the bottom, not the top, of the business cycle.

The staple commodities are very low. The prices at which they are selling are beginning to attract some speculative buying, and it remains to be seen whether the demand will be sufficient to absorb the offerings. This is particularly true of the cotton crop.

Money continues phenomenally cheap, and is a factor in the situation which must sooner or later have its effect. In the stock market, efforts to electrify some of the old speculative favorites are apparent from time to time. Last week they were not often successful, as most of the larger operators were away and those who were here maintained an indifferent attitude. On the whole, prices are a little lower.

The views of many whose success entitles their opinions to consideration are that the market will get its next impulse from the November elections. On this theory a strong upward movement is expected if the voters fail to support the radicals in their attacks on big business. This is an euphemistic way of saying that trade and industry prefer to be let alone, and that they will prosper if they are not interfered with. Probably this is true, although change is the law of life, and it is idle to hope for a world that will be static.

Looking back upon the past, there seems little reason for alarm in a country which has survived so many attacks of radicalism and has grown richer and more prosperous meanwhile.

The Department of Agriculture says that the drouth which has baked large areas for many weeks is the worst on record since the compilation of weather reports began. If speculation were active in the wheat and cotton markets they would almost certainly be higher, but so far the only commodity affected much is corn, which is upsetting time-honored price levels by selling for more than wheat.

The question of agricultural relief has become a major issue in the politico-economic situation of the United States today. Much depends upon the course that is to be followed, and if some way to avert a further decline in commodity values can be found the situation ought soon to clear itself up.

In Europe, the situation is hardly as satisfactory as here. The number of unemployed is larger, and the political outlook is more confused than it was. Von Hindenberg's suspension of the German Constitution and the Canadian elections disclose more or less unrest.

In Canada the vote cast is construed as authorizing the new Premier to attempt some economic reprisals on the United States by way of making us understand how important the Canadian market is to our exporters and manufacturers. Provided it does not go too far this is not to be regretted, but any action that should seriously disturb the *entente cordiale* which has existed between Canada and the United States for so long would be a matter of regret.

### THE BUSINESS WEEK

*August 6, 1930*

**"EXACTLY a year after business sealed the peak of its 1929 boom it is reaching its low in the subsequent depression. . . . Our index has dropped again, from 94.4% of normal to 91.1%, as compared with the high point of 114.6% a year ago, and will probably fall farther next week . . . August will bring definite signs of improvement, beginning with the basic industries, and as we move further into the last half, the paralyzing pessimism of recent months will find less to feed on in the comparative records of this year and last. . . . Although the usual seasonal decline of building contracts has set in rapidly, abundant security issues for public and private work in the past quarter will cushion the decline, and the contracts placed so far will carry over into the business activity during the rest of the year. . . . While general trade is beginning to sag under the pressure of months of impaired purchasing power and business confidence, industrial activity and railroad movement of merchandise show signs of revival under the stimulus of depleted stocks, and non-agricultural commodity prices are strengthening. . . . At this crucial turning point, emergency Farm Board support of farm prices against the weight of temporary wheat and cotton surpluses, and further Federal Reserve support of the bond market are vitally necessary and wholly justifiable."**

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*95 Broad St., New York*

# THE WEEKLY PRICE GUIDE . . . .

### *Rise and Fall of the Market*

TIN-PLATE, sheet and strip mills have reduced operations and the steel trade remains quiet except for the call for line pipe and the improved prospect for rail purchasing. Brisk demand for copper and lead. The base copper price is 11c. for Eastern deliveries and 11⅛ cents west to Chicago, with public utilities the principal large-lot buyers. Last week was a record for lead sales, 5,000 tons being taken by a single public utility factor.

(*All prices as of August* 1, 1930)

## IRON AND STEEL

**PIG IRON**—Per gross ton, f.o.b.:

| | |
|---|---|
| CINCINNATI | |
| No. 2 Southern (silicon 1.75@2.25) | $16.69@$18.19 |
| Northern Basic | 19.89@ 20.39 |
| Southern Ohio No. 2 | 19.89@ 20.39 |
| NEW YORK—Tidewater Delivery | |
| No. 2 Southern (silicon 1.75@2.25) | 18.00@ 18.50 |
| BIRMINGHAM | |
| No. 2 Foundry (silicon 1.75@2.25) | 14.00 |
| PHILADELPHIA | |
| Eastern Pa., No. 2x (silicon 2.25@2.75) | 20.00 |
| Virginia No. 2 | 18.75@ 19.25 |
| Basic | 22.29 |
| CHICAGO | |
| No. 2 Foundry, local (silicon 1.75@2.25) | 19.00 |
| No. 2 Foundry, Southern (silicon 1.75@2.25) | 18.20 |
| PITTSBURGH, including freight charge ($1.76) from Valley: | |
| No. 2 Foundry | 19.63@ 20.13 |
| Basic | 19.63@ 20.13 |
| Bessemer | 20.76 |

**IRON MACHINERY CASTINGS**—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

| | |
|---|---|
| Detroit | 4.50 |
| Cleveland | 5.00 |
| Cincinnati | 4.50 |
| New York | 5.25 |
| Chicago | 4.50@4.75 |

**SHEETS**—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots:

| Blue Annealed* | Pittsburgh Mill Base | Chicago | Cleveland | New York |
|---|---|---|---|---|
| No. 10 | 1.80@2.00 | 3.35† | 3.00 | 3.40† |
| No. 12 | 1.85@2.05 | 3.45† | 3.10 | 3.45† |
| No. 14 | 1.95@2.15 | 3.55† | 3.20 | 3.50† |
| No. 16 | 2.05@2.25 | 3.65† | 3.30 | 3.60† |
| Black | | | | |
| Nos. 18 to 20 | 2.25@2.35 | 3.85† | 3.40 | 3.45@3.70 |
| No. 22 | 2.40@2.50 | 4.00† | 3.55 | 3.60@3.85 |
| No. 24 | 2.45@2.55 | 4.05† | 3.60 | 3.65@3.90 |
| No. 26 | 2.55@2.65 | 4.15† | 3.70 | 3.75@4.00 |
| No. 28 | 2.70@2.80 | 4.75† | 3.85 | 3.90@4.15 |
| Galvanized | | | | |
| No. 10 | 2.45 | 3.90† | 3.65 | 3.55 |
| Nos. 12 to 14 | 2.55 | 4.00† | 3.75 | 3.65 |
| No. 16 | 2.65 | 4.10† | 3.85 | 3.75 |
| No. 18 | 2.80 | 4.25† | 4.00 | 3.90 |
| No. 20 | 2.95 | 4.40† | 4.15 | 4.05 |
| No. 22 | 3.00 | 4.45† | 4.20 | 4.10 |
| No. 24 | 3.15 | 4.60† | 4.35 | 4.25 |
| No. 26 | 3.40 | 4.85† | 4.60 | 4.50 |
| No. 28 | 3.65 | 5.10† | 4.85 | 4.75 |

*Light Plates. †400 to 3,999 lb.

**WELDED STEEL PIPE**—Warehouse discounts are as follows:

| | New York Black | New York Galv. | Cleveland Black | Cleveland Galv. | Chicago Black | Chicago Galv. |
|---|---|---|---|---|---|---|
| 1 to 3 in. butt | 56.14% | 43.6% | 53.3% | 42.3% | 57.3% | 44.8% |
| 3½ to 6 in. lap | 52.72% | 40.18% | 50.8% | 37.8% | 53.9% | 41.4% |

WROUGHT-STEEL PIPE LIST

| Size, Inches | List Price per Foot | Diameter in Inches—External | Diameter in Inches—Internal | Thickness Inches |
|---|---|---|---|---|
| ⅛ | $0.17 | 1.315 | 1.049 | .133 |
| ¼ | .23 | 1.66 | 1.38 | .14 |
| ⅜ | .27½ | 1.9 | 1.61 | .145 |
| ½ | .37 | 2.375 | 2.067 | .154 |
| ¾ | .58½ | 2.875 | 2.469 | .203 |
| 1 | .76½ | 3.5 | 3.068 | .216 |
| 1¼ | .92 | 4.0 | 3.548 | .226 |
| 1½ | 1.09 | 4.5 | 4.026 | .237 |
| 2 | 1.48 | 5.563 | 5.047 | .258 |
| 2½ | 1.92 | 6.625 | 6.065 | .28 |
| 3 | 2.50 | 8.625 | 8.071 | .277 |

**SEAMLESS STEEL TUBING**—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb.:

| Decimal | B.w.g. and Fractions | Outside Diameter in Inches ⅛ | ¼ | ⅜ | ½ | ⅝ | ¾ | 1 | 1¼ | 1½ |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Price per Foot | | | | | | | | |
| .035″ | 20 | $0.15 | $0.16 | $0.17 | $0.18 | $0.19 | $0.21 | $0.23 | | |
| .049″ | 18 | .17 | .18 | .19 | .20 | .21 | .23 | .25 | | |
| .065″ | 16 | .19 | .20 | .21 | .22 | .23 | .25 | .27 | | |
| .083″ | 14 | .20 | .22 | .23 | .24 | .25 | .27 | .29 | | |
| .095″ | 13 | .21 | .23 | .25 | .26 | .27 | .29 | .31 | | |
| .109″ | 12 | .22 | .24 | .26 | .27 | .28 | .30 | .32 | | |
| .120″ or .125″ | 11 | .23 | .25 | .27 | .28 | .29 | .31 | .33 | | |
| .134″ | 10 | .24 | .26 | .28 | .29 | .30 | .32 | .34 | | |

**MISCELLANEOUS**—Warehouse base prices in cents per lb.:

| | New York | Cleveland | Chicago |
|---|---|---|---|
| Spring steel, light* | 4.50 | 4.65 | 4.65 |
| Spring steel, heavier | 4.00 | 4.00 | 4.00 |
| Coppered Bessemer rods | 6.05 | 6.00 | 6.20 |
| Hoop steel | 3.75† | 4.00 | 3.75† |
| Cold rolled strip steel | 4.95 | 6.00 | 6.10 |
| Floor plates | 4.85† | 5.30 | 5.00† |
| Cold fin., round or hexagon‡ | 3.40 | 3.65 | 3.35 |
| Cold fin,, flat or square‡ | 3.90 | 4.15 | 3.85 |
| Structural shapes | 3.10† | 3.00 | 3.00† |
| Soft steel bars | 3.10† | 3.00 | 3.00† |
| Soft steel bar shapes | 3.10† | 3.00 | 3.00† |
| Soft steel bands | 3.40† | 3.65 | 3.20† |
| Tank plates | 3.10† | 3.00 | 3.00† |
| Bar iron (2.75 at mill) | 3.24 | 3.00 | 3.00 |
| Drill rod (from list) | 60% | 55% | 50% |

*Flat, $\frac{3}{16}$-in. thick by $\frac{3}{4}$-in. wide. †400 to 3,999 lb., ordered and released for shipment at one time. ‡Cold finished steel, shafting and screw stock.

Electric welding wire at New York warehouse—$\frac{3}{32}$, 8.35c. per lb.; $\frac{1}{8}$, 7.85c. per lb.; $\frac{5}{32}$ to $\frac{1}{8}$, 7.35c. per lb.

## METALS

Warehouse Delivery Prices in Cents Per Lb. for Small Lots:

| | | | |
|---|---|---|---|
| Copper, electrolytic, New York | | | 13.00 |
| Tin, Straits, pigs, New York | | | 32.00@33.00 |
| Lead, pigs, E. St. Louis | 5.15 | New York | 6.25@ 6.75 |
| Zinc, slabs, E. St. Louis | 4.40 | New York | 6.25@ 7.25 |

| | New York | Cleveland | Chicago |
|---|---|---|---|
| Antimony, slabs | 9.75@10.25 | 10.25 | 11.50 |
| Copper sheets* | 20.75 | 20.75 | 21.25 |
| Copper wire* | 13.00 | 13.87½ | 13.37½ |
| Copper, drawn, round* | 19.25 | 19.25 | 19.75 |
| Copper tubing* | 23.00 | 23.00 | 23.50 |
| Brass sheets, high* | 17.87½ | 17.87½ | 18.25 |
| Brass tubing, high* | 22.75 | 22.75 | 23.25 |
| Brass rods, high* | 16.12½ | 16.12½ | 16.50 |
| Brass wire, high* | 18.75 | 18.37½ | 18.75 |

*Mill, base.

# SHOP MATERIALS AND SUPPLIES

## METALS—Continued

| | New York | Cleveland | Chicago |
|---|---|---|---|
| Aluminum ingots, 99%† | 23.30 | 24.30 | 23.30 |
| Zinc sheets (casks) | 9.75@10.50 | 11.25 | 10.11 |
| Solder (½ and ½) | 24.50 | 23.50 | 24@26 |

Babbitt metal, delivered in case lots, New York, cents per lb.:

| | |
|---|---|
| Genuine, highest grade | 49.00 |
| Commercial genuine, intermediate grade | 36.00 |
| Anti-friction metal, general service | 31.00 |
| No. 4 babbitt, f.o.b. | 10.25 |

†F.O.B.

**NICKEL AND MONEL METAL**—Price in cents per lb., base, f.o.b. Huntington, W. Va.:

| | Nickel | Monel Metal |
|---|---|---|
| Sheets, full finished | 52.00 | 42.00 |
| Sheets, cold rolled | 60.00 | 50.00 |
| Strip, cold rolled | 55.00 | 45.00 |
| Rods, hot rolled | 45.00 | 35.00 |
| Rods, cold drawn | 50.00 | 40.00 |
| Tubing | 75.00* | 90.00† |
| Angles, hot rolled | 50.00 | 40.00 |
| Plates | 52.00 | 42.00 |

*Seamless. †Welded.

**OLD METALS**—Dealers' purchasing prices in cents per pound, f.o.b. cars:

| | New York | Cleveland | Chicago |
|---|---|---|---|
| Crucible copper | 9.00@9.50 | 9.00 | 8.75@9.25 |
| Copper, heavy, and wire | 8.25@8.50 | 8.75 | 8.00@8.50 |
| Copper, light, and bottoms | 7.25@7.75 | 8.50 | 7.00@7.50 |
| Heavy lead | 4.00@4.12½ | 4.00 | 3.25@3.75 |
| Tea lead | 2.00@2.25 | 2.50 | 2.25@2.75 |
| Brass, heavy, yellow | 5.00@5.25 | 5.00 | 5.00@5.50 |
| Brass, heavy, red | 7.25@7.50 | 7.75 | 7.25@7.75 |
| Brass, light | 4.00@4.25 | 4.00 | 4.50@5.00 |
| No. 1 rod-brass turnings | 5.25@5.50 | 5.00 | 5.50@6.00 |
| Zinc | 2.00@2.25 | 1.50 | 1.75@2.00 |

**TIN PLATES**—Charcoal—Bright—Per box:

| "AAA" Grade: | New York | Cleveland | Chicago |
|---|---|---|---|
| IC, 14x20 | $12.10 | $11.95 | $11.50 |
| "A" Grade: | | | |
| IC, 14x20 | 9.70 | 9.90 | 9.50 |
| Coke Plates—Primes—Per box: | | | |
| 100-lb., 14x20 | 6.45 | 6.10 | 7.00 |
| Terne Plates—8-lb. Coating—Small lots—Per box: | | | |
| IC, 14x20 | 7.75@8.00 | 7.00 | 7.50 |

## MISCELLANEOUS

| | New York | Cleveland | Chicago |
|---|---|---|---|
| Cotton waste, white, per lb. | $0.13 | $0.16 | $0.15 |
| Cotton waste, colored, per lb. | .09½ | .12 | .12 |
| Wiping cloths, washed, white, per lb. | .13½ | 38.00 per M | .16 |
| Sal soda, per lb. | .01¾ | .02 | .02 |
| Roll sulphur, per lb. | .028 | .03½ | .04 |
| Linseed oil, raw, in 1 to 4 bbl. lots, per lb. | .146 | .164 | .148 |
| Cutting oil, about 25% lard, in 5 gal. cans, per gal. | .65 | .60 | .65 |
| Machine oil, medium-bodied (55 gal. steel bbl.) per gal. | .33 | .36 | .24 |
| Belting—Present discounts from list in fair quantities (½ doz. rolls) for leather or rubber: | | | |
| Leather—List price, 24c. per lin.ft., per inch of width, for single ply: | | | |
| Medium grade | 30–10% | 30–10% | 35% |
| Med. grade, heavy wgt. | 30% | 30 –5% | 30% |
| Rubber transmission, 6-in., 6 ply, $1.83 per lin.ft.: | | | |
| First grade | 50% | 50–10% | 50% |
| Second grade | 60% | 60– 5% | 50–10% |

## *Comparative Warehouse Prices*

| New York | Unit | Current Price | Four Weeks Ago | One Year Ago |
|---|---|---|---|---|
| Soft steel bars | per lb. | $0.031 | $0.0325 | $0.0325 |
| Cold fin. shafting | per lb. | .034 | .034 | .036 |
| Brass rods | per lb. | .1612½ | .1725 | .2125 |
| Solder (½ and ½) | per lb. | .245 | .245 | .325 |
| Cotton waste, white | per lb. | .13 | .13 | .10@.13½ |
| Disks, aluminumoxide mineral, cloth, No. 1 6-in. dia. | per 100 | 4.59 | 4.59 | 3.60 |
| Lard cutting oil | per gal. | .65 | .65 | .75 |
| Machine oil | per gal. | .33 | .33 | .33 |
| Belting, leather, medium | off list | 30–10% | 30–10% | 30–10% |
| Machine bolts, up to 1x30 in., full kegs | off list | 50–10%* | 50–10%* | 50–10%* |

*List prices as of April 1, 1927

## MISCELLANEOUS—Continued

| | New York | Cleveland | Chicago |
|---|---|---|---|
| Abrasive materials — Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets: | | | |
| Flint paper* | $6.03 | $6.03 | $6.03 |
| Emery cloth* | 25.87 | 25.87 | 25.87 |
| Disks, aluminum oxide mineral, 6 in. dia., No. 1, per 100: | | | |
| Paper† | 2.61 | 2.61 | 2.61 |
| Cloth† | 4.59 | 4.59 | 4.59 |
| Fire clay, per 100 lb. bag | 1.00 | .75 | .75 |
| Coke, prompt furnace, per net ton | Connellsville, | | 2.50 |
| Coke, prompt foundry, per net ton | Connellsville, | | 3.50@4.85 |
| White lead, dry | 100 lb. kegs | New York, | 13.75 |
| White lead, in oil | 100 lb. kegs | New York, | 13.75 |
| Red lead, dry | 100 lb. kegs | New York, | 13.75 |
| Red lead, in oil | 100 lb. kegs | New York, | 15.25 |

*Less than 3 reams. †Less than 200.

## SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

| | |
|---|---|
| Machine bolts: | |
| Up to ¾-in. x 6-in., full kegs, list less | 60% |
| Larger, up to 1 x 30-in., full kegs, list less | 50–10% |
| Less than full kegs or case lots, add to list | 10% |
| Fitting-up bolts: list less | 45% |
| Lag screws: | |
| Up to ½-in. x 6-in., list less | 60% |
| Larger, list less | 50–10% |
| Less than full keg or case lots, add to list | 10% |
| Rivets: | |
| Structural, round head, full kegs, net | $4.50 |
| Structural, round head, broken kegs, net | 6.00 |
| Tank, 7/16-in. dia. and smaller, list less | 60% |
| Nuts: | |
| Hot pressed, square or hexagonal, blank or tapped: | |
| Full kegs up to 1-in., incl., list less | 60% |
| Larger, up to 3-in., list less | 40–10% |
| Less than keg or case lots, add to list | 10% |
| Washers: | |
| Wrought, full kegs, per 100 lb., list less | $4.00 |
| Wrought, broken kegs, per 100 lb., list less | 2.00 |
| Turnbuckles: | |
| With stub ends, list less | 20% |
| Without stub ends, list less | 50% |
| Chain: | |
| Proof coil, base, per 100 lb., net | $8.50 |
| Cast iron welding flux, per lb., net | .35 |
| Bronzing flux, per lb., net | .50 |

# MACHINE REQUIREMENTS AND INDUSTRIAL CONSTRUCTION

## Equipment Wanted

**D. C., Washington**—A. L. Flint, General Purchasing Officer of the Panama Canal, will receive bids until Aug. 20, for valve-seating machines, drills, etc.

**Miss., Laurel** — C. P. Limbert Co., Holland, Mich. — machinery and equipment for the manufacture of furniture for proposed 1 story, 100 x 1,000 ft. factory here. Estimated cost $175,000.

## Opportunities for Future Business

**Calif., Los Angeles** — Robinson Fireproof Building Co., plans the construction of a 4 story, 230 x 67 x 93 ft. warehouse and garage at 8th Pl. Estimated cost $150,000. Dodd & Richards, 606 Architects Bldg., Archts.

**Conn., New Haven**—Continental Baking Co., 140 Canal St., awarded contract for the construction of a 1 and 2 story, 60 x 150 ft. garage and service building. Estimated cost $40,000.

**Ill., Chicago**—Car Service Inc., 1921 Indian Ave., awarded masonry and carpentry contracts for a 4 story, 90 x 143 ft. repair and service garage at 1905 Indiana Ave. Estimated cost $200,000.

**Md., Baltimore**—Commercial Pigments Corp., 2001 Benhill St., awarded contract for the construction of a 70 x 92 ft. machine shop. Estimated cost $200,000.

**Md., Baltimore**—U. S. Government, Fourth Assistant Postmaster General, Washington, D. C., awarded contract for the construction of a 1 story post office, garage and repair shop at 439-57 East Preston St., here. Estimated cost $200,000.

**Mass., Boston**—Boston Elevated Railway Co., Park Sq. Bldg., will receive bids until Aug. 7 for the construction of a bus garage at Washington and Bartlett Sts. Estimated cost $200,000. Private plans.

**Mass., Cambridge** (Boston P.O.)—American Oil Co. of Massachusetts, 465 Rindge Ave., is having plans prepared for the construction of a 1 story garage and service station at 104 Mt. Auburn St. Estimated cost $60,000. Fay Spofford & Thorndike, 44 School St., Boston, Engrs.

**Minn., Duluth**—Wahl Candy Co., T. W. Wahl, West Second St., will soon receive bids for the consjruction of a 2 story, 100 x 140 ft. garage. Estimated cost $50,000. J. J. Wangenstein, 310 Palladis Bldg., Archt.

**Minn., Minneapolis** — Windom Block Realty Co., c/o Liebenberg & Kaplan, 710 McKnight Bldg., Archts., awarded contract for the construction of a 2 story, 155 x 158 ft. garage at 13th St. and Harmon Pl. Estimated cost $200,000. Holt Motor Co., 1301 Hennepin Ave., lessee.

**Mo., Jefferson City**—State Highway Commission of Missouri, c/o T. H. Cutler, Ch. Engr., received lowest bid for the construction of a headquarters garage and record building from McCarthy Bros. Construction Co., 233 Langan-Taylor Bldg., St. Louis, $126,790. Noted July 10.

**N. J., Bound Brook** — Bakelite Corp., 247 Park Ave., New York, N. Y., awarded contract for the construction of a 1, 2 and 3 story factory, including machine shop, etc., here. Estimated cost $150,000.

**N. J., Elizabeth**—Public Service Co-Ordinated Transport Co., 80 Park Pl., will build a 1 story, 100 x 240 ft. addition to garage at Division and Livingston Sts. Estimated cost $150,000. Private plans. Work will be done by separate contracts. Noted July 31.

Industrial building contracts of $40,000 or more awarded in the first half of 1930 totaled $200,000,000, compared with $321,000,000 in that period of 1929, and $146,000,000 in 1928. Construction in eight important groups was as follows:

| | | |
|---|---|---|
| Automotive | 12 | $960,000 |
| Service garages | 116 | 8,481,000 |
| Coke | 3 | 1,120,000 |
| Electric power plants | 99 | 61,654,000 |
| Foundries | 16 | 1,000,000 |
| Iron and steel products | 37 | 23,498,000 |
| Lumber and woodworking | 11 | 820,000 |
| Machine shops | 47 | 2,643,000 |
| Total | 341 | $100,176,000 |
| Other industrials | 557 | 100,306,000 |
| Grand total | 898 | $200,482,000 |
| Average contract | | 223,000 |

**N. J., Fort Lee**—Consolidated Film Industries Inc., Lemoine Ave., is receiving bids for a 1 story, 25 x 240 ft. machine shop and 1 story, 20 x 200 ft. shipping building. Estimated cost $75,000. G. W. Dexter, 201 Main St., Archt. Noted July 24.

**N. J., Hawthorne** — S. Braen, 115 Totawa Ave., Paterson, will not construct 2 story, 90 x 140 ft. garage at Nelson and Padadena Aves., here. $150,000. Project in abeyance. Noted July 31.

**N. J., Maplewood**—LeRoy Schenck, 513 Valley St., is receiving bids for the construction of a 2 story garage and shop. Estimated cost $140,000. R. B. Platt, 600 Bloomfield Ave., Bloomfield, Archt.

**N. J., Montclair**—A. E. Ramhurst, 516 Bloomfield Ave., Archt., is receiving bids for a 2 story, 100 x 165 ft. garage at Grove and Glenridge Sts. for L. White, c/o Archt. Estimated cost $150,000. Noted July 31.

**N. Y., Cortland** — Brewer-Tichenor Corp., awarded contract for the construction of a 1 story factory for the manufacture of hardware for electrical trade. Estimated cost $100,000.

**N. Y., Leroy**—Lapp Insulator Co., awarded contract for the construction of a 1 story factory. Estimated cost $40,000.

**O., Geneva** — American Fork & Hoe Co., G. B. Durrell, Pres., B. F. Keith Bldg., Cleveland, awarded contract for the construction of a 2 story, 53 x 251 ft. factory, here. Estimated cost $75,000.

**O., Cleveland**—American Steel & Wire Co., J. S. Keefe, Pres., Rockefeller Bldg., awarded masonry contract for a 1 story, 80 x 700 ft. addition to steel mill at East 42nd and Harvard Ave. Estimated cost $150,000.

**O., Marion**—Marion Vault Mfg. Co., is having plans prepared for the construction of a 1 story factory. Estimated cost $40,000. Private plans.

**O., Cleveland**—Valuation Service Co., c/o Guardian Trust Co., 623 Euclid Ave., awarded contract for a 2 story addition to factory at 7275 Wentworth Ave. Estimated cost $50,000.

**Pennsylvania**—Jones & Laughlin Steel Corp., Ross St., Pittsburgh, plans extensions and improvements to mills at Pittsburgh and Aliquippa. Estimated cost approximately $20,000,000.

**R. I., Newport**—C. B. Lawton and A. J. King, Marlboro St., awarded contract for the construction of a 1 story garage and repair shop at Marlboro and Branch Sts. Estimated cost $50,000.

**Tex., Houston**—Bd. of Education, Houston Independent School District, H. L. Mills, Bus. Mgr., 1600 Washington Ave. or P. O. Box 1226, will soon award contract for a sheet iron shop building at Taylor Vocational School.

**Ont., New Toronto** — Anaconda American Brass Ltd., plans 1 story, 70 x 450 and 98 x 100 ft. additions to plant. Estimated cost $200,000. Private plans.

**Ont., Sault Ste. Marie**—Algoma Steel Corp. Ltd., J. D. Jones, Mgr., 503 Queen St. E., plans the construction of a 1 story addition to rolling mill. Estimated cost $1,250,000.


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